



# Imperial Bureau of Plant Genetics

(For Crops other than Herbage)

**Plant Breeding Abstracts**  
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Note.—Initial abstracts are written by the following :

Dr. A. Buchinger ... ..	A. B.
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Dr. J. Wishart ... ..	J. W.

\* General studies, see also individual crops.

# Plant Breeding Abstracts.

## Vol. V, No. 3.

### Part I. British Empire

#### STATISTICS 519

536. ZINZADZE, C. and YATES, F. 519.24(016)  
631.421(016)  
**Bibliography of statistical methods, chiefly on the application of the analysis of variance.**

Statist. Dep. Rothamsted Exp. Sta. Harpenden, Herts 1933: Pp. 27.

A classified bibliography of the main publications up to the end of 1933 for students who wish to study new statistical methods and for the advanced statistician who wants to become acquainted with the problems confronting research workers. Special emphasis has been laid on the applications of the analysis of variance.

#### GENETICS 575

537. KOSTOFF, D. 575.24:581.036  
**Mutations and the ageing of seeds.**  
Nature, Lond. 1935: **135**: (Suppl.) p. 107.

A note on the priority of the finding of various investigators of the effect of ageing on mutation. (Cf. "Plant Breeding Abstracts" Vol. IV, Absts. 1 and 82.)

#### CYTOLOGY 576.3

538. WRINCH, D. M. 576.312:577.1  
**Chromosome behaviour in terms of protein pattern.**  
Nature, Lond. 1934: **134**: 978-79.

A preliminary attempt to relate the properties of chromosomes and the facts of genetics with protein structure.

539. DARLINGTON, C. D. 576.312.32:576.35  
**Mechanical aspects of nuclear division.**  
Sci. J. R. Coll. Sci. 1934: **4**: 93-95.

From a comparative study of meiosis in homozygous organisms it may be inferred that not only are the forces of attraction and repulsion operating at meiosis universally the same in such forms, but they are also the same as those acting at mitosis.

The nature and distribution of these forces has been examined by quantitative studies of terminalization of chiasmata, and evidence has been found in favour of the hypothesis of electrical charges on the surfaces of the chromosomes as the basis of chromosome behaviour at prophase and also metaphase and anaphase.

Spiralization (and possibly also crossing-over) may, it seems likely, be due to tensions set up in the chromosome threads, as a result of change in the pH.

The value of such assumptions in the attempt to elucidate the whole range of chromosome behaviour must be examined in collaboration with the physicists.

540. DARLINGTON, C. D. 576.356:581.162.5  
**Chromosomes and plant breeding.**  
Proc. Ass. Econ. Biol. Coimbatore. 1934: **1**: 80-81.

The lecturer dealt with chromosomes in relation to sterility under the three headings (1) relational, (2) morphological and (3) generational sterility. The different types of chromosome behaviour contributing to sterility were also described and exemplified.

541. GATES, R. R. 576.35  
**Symbols for chromosome numbers.**  
 Nature, Lond. 1934 : 134 : p. 1011.

It is suggested that in order to avoid further confusion a new symbol such as  $\phi$  should be used to designate the basic number of chromosomes in genera containing polyploid series.

542. SCHAFFER, B. 576.35  
**Symbols for chromosome numbers.**  
 Nature, Lond. 1935 : 135 : (Suppl.) p. 109.

In a reply to Professor Gates' suggested use of  $\phi$  to designate the basic chromosome number (see Abst. 541) the practical disadvantages of using a Greek letter are pointed out and instead  $x$  for the basic and  $n$  for the haploid number is advocated.

543. GATES, R. R. 576.35  
**Symbols for chromosome numbers.**  
 Nature, Lond. 1935 : 135 : 188-89.

In reply to Miss Schaffer's criticism (see Abst. 542) Professor Gates points out that both  $x$  and  $n$  are still in use for the designation of the haploid number and suggests  $b$  as a suitable symbol for the basic chromosome number, so avoiding the difficulties involved in the use of a Greek letter.

#### FIELD TESTS 631.421

544. SUMMERBY, R. 631.421:519.24  
**The value of preliminary uniformity trials in increasing the precision of field experiments.**  
 Tech. Bull. MacDonald Agric. Coll. 1934 : No. 15 : Pp. 64.

An intensive study of the crop yields from 1922 to 1932 on four ranges of land at MacDonald College, Quebec, has enabled the writer to draw definite conclusions concerning the value of preliminary information about the yielding capacity of experimental land, as given by preliminary uniformity trials.

By recording all yields in terms of plots, 20 by 20 links in size, it was possible through combinations of these unit plots to obtain comparisons of the error variance of different sized plots, with and without the use of local control layouts, such as randomized blocks and latin squares.

The analysis of covariance technique was then used in all cases to shew the effect of adjusting arbitrarily chosen experimental yields for preliminary yields, obtained from the year immediately before or a few years before the experimental yield ; from a single previous year or a series of years ; from similar or dissimilar previous crops.

In all cases, tables are given shewing the correlation relationships and the relative precisions attained for different sized plots by such adjustments.

In spite of the fact that correlation coefficients on the whole are high and positive, the author concludes that although preliminary trials are useful for indicating the areas unsuitable for experimentation, and which type of local control should be adopted, yet the precision to be attained by using them as a means of adjusting the experimental yields is decidedly less than that accruing from the use of sound local control methods in the actual experiment. G.B.L.

545. WISHART, J. 631.421:519.24  
**Analysis of variance and analysis of covariance, their meaning, and their application in crop experimentation.**  
 Rep. and Summary Proc., 2nd Conf. Cott. Grow. Prob., Emp. Cott. Grow. Corp. 1934 : 83-96.

The basic principles of the "randomised blocks" and "Latin square" methods of laying out field experiments are discussed briefly, and it is shewn how these methods have been designed to take into account the vagaries of the soil variation over experimental areas. The analysis of variance is then simply the statistical process of examining the significance of the experimental results in such a manner as to take full account of the advantages of the lay-out. Reference is made to the possibility of losing efficiency in too complicated randomized block experiments where treatments have not been adequately replicated. With practical suggestions for its use, the writer explains how the analysis of covariance technique may be used in conjunction with the analysis of variance in attempts to increase the precision of field experiments. G.B.L.

## ECONOMIC PLANTS 633

546. HUNTER, H. 633:575(47.1)  
**Report on a visit to certain plant breeding and other experimental stations in Finland, September, 1934.**

Minist. Agric. and Fisheries, Lond. Pp. 8. (Mimeographed).

The organization of the Department of Plant Breeding at Jokioninen and its relations with other research bodies is outlined and a general survey is given of cereal breeding in Finland. Owing to the importance of cold resistance the land varieties which are adapted to the rigorous climate constitute particularly useful initial material of which advantage is taken in the breeding of wheat, rye, barley, etc.

The performance and characteristics of a number of the most important productions obtained by selection from land wheats or by selection and hybridization are cited.

In rye breeding, standing capacity of straw and rust resistance are considered.

The geographical distribution of native varieties of barleys and their taxonomic identification are dealt with and their use in breeding by selection and crossing indicated.

The basis of the method used in breeding cold resistant wheats is specially mentioned.

633:575(48.9)

633:575(48.5)

633:575(44)

547. HUNTER, H.  
**Report of a visit to certain plant breeding stations in Denmark, Sweden and France, September, 1933.**

Minist. Agric. and Fisheries, Lond. Pp. 14. (Mimeographed).

*Denmark :—*

The tour began with a visit to Øtøftegaard where, in addition to seed raising, improved strains of root crops of superior quality and also resistant to disease and cold are produced. A special freezing plant is used for cold resistance studies of roots and wheat.

An account is given of recent developments in barley breeding which are directed mainly to the production of stiffer strawed varieties, though yield has also been improved. At the station at Abed information was obtained about new varieties and their origin and characteristics, and the breeding procedure used, are described. The most outstanding variety in Denmark and in Sweden too is the Svalöf Örn, bred from Victory x von Lochow's Yellow oat.

Methods of root breeding in Denmark are discussed and the work on diseases of oats at the Royal Veterinary High School, Copenhagen, is mentioned.

*Sweden :—*

A full report is given of barley breeding, with descriptions of the most important varieties and their origin and performance in variety trials.

The aim in oat breeding is to evolve three types, a white oat, a black oat and an early maturing oat adapted to Southern, Central and Northern Sweden respectively.

The new cold resistance plant at Svalöf was inspected.

The objectives in wheat breeding are high yield and good standing straw combined with high baking quality, winter hardiness and adaption to the three districts already mentioned. A full description of the various hybrids is given and observations on systems of plant breeding and especially the procedure of selection and breeding of cereals at Svalöf are recorded.

Mangel breeding is also carried out at Svalöf, the Barres strain being the foundation of the most valued strains cultivated in Sweden.

The work at Svalöf is aided by various sub-stations in the Northern, Central and Southern districts.

*France :—*

The cereal breeding establishment of Vilmorin-Andrieux was visited and observations on oat and barley breeding are given. As in Scandinavia the variety Hanna forms the basis of the material used in barley improvement and several varieties under test by the Société d'Encouragement de la Culture des Orges de Brasserie also originated from this variety.

548. 633:575:578.08  
633:575.42  
RAMANATHAN, V.

**The problem of selection for yield in hybrid progenies.**

Proc. Ass. Econ. Biol. Coimbatore 1934 : 1 : 61-68.

The difficulties in selecting suitable plants at the various stages of selection for yield in hybrid progenies were described and various possible methods of identifying the best yielding strains in the shortest time were put forward for consideration and discussion. The question of how the effects of heterosis might best be detected and eliminated received special attention.

549. 633:576.16:575  
HUDSON, P. S.

**Origin of cultivated plants.**

Proc. Ass. Econ. Biol. Coimbatore 1934 : 1 : 85-88.

An analysis shewing the interest which Vavilov's views on the origin of cultivated plants may have for the plant breeder.

### CEREALS 633.1

550. 633.1-2.452-1.521.6  
NEWTON M. and BROWN, A. M.  
**Studies on the nature of disease resistance in cereals. I. The reactions to rust of mature and immature tissues.**  
Canad. J. Res. 1934 : 11 : 564-81.

If the plants in the seedling stage shewed immunity to certain physiological forms of rust then even the immature and rapidly growing tissues when inoculated shewed resistance. Otherwise, it was found that such young tissues were highly susceptible even though the mature issues shewed a high resistance and the susceptibility was found by artificial inoculation tests to be extended to varieties of rust which do not normally attack the plant, for under natural conditions the immature tissues are adequately protected against infection.

The results indicate that resistance is not to be explained on a morphological basis but some change in the protoplasm during development is suggested.

551. 633.1-2.452-1.521.6  
633.11:581.192  
JOHNSON, T. and JOHNSON, O.  
**Studies on the nature of disease resistance in cereals. II. The relationship between sugar content and reaction to stem rust of mature and immature tissues of the wheat plant.**  
Canad. J. Res. 1934 : 11 : 582-88.

In continuation of the work already described (see Abst. No. 550) an examination of the sugar content of young and mature tissues in resistant and susceptible varieties of wheat shewed that as the sugar content of the young tissues was considerably higher than that of the mature tissues in all the varieties tested, there was no direct correlation between sugar content and rust resistance.

### WHEAT 633.11

552. 633.11 Nabawa  
633.11-2-1.521.6(94)  
WENHOLZ, H.  
**Nabawa wheat. A variety of widespread popularity.**  
Agric. Gaz. N.S.W. 1934 : 45 : 547-49.

The ancestry, history and area of distribution of this Australian wheat, highly resistant to flag smut and moderately resistant to stem rust, are given.

Its chief defect is a weakness of straw, which reduces the yield except under dry conditions. (Cf. also "Plant Breeding Abstracts," Vol. V, Abst. 215.)

553. WENHOLZ, H. 633.11(94.2)  
**Australian wheats. The parentage or origin of noteworthy varieties.**  
**Part I.**  
 S.U.A.G.A. (Bull. Sydney Univ. Agric. Graduates' Ass.) 1934 : Issue No. 15 : 15-21.  
 WENHOLZ, H.  
**Australian wheats. The parentage or origin of noteworthy varieties.**  
**Part II** [concluded].  
 S.U.A.G.A. (Bull. Sydney Univ. Agric. Graduates' Ass.) 1934 : Issue No. 16 : 17-23.

The origin or parentage of noteworthy varieties of wheat which have contributed to the production of the present Australian wheats is briefly described.

554. SCOTT, A. S. 633.11:575(71)  
**Canadian wheat breeding.**  
 Estate Mag. 1934 : 34 : 838-40.

A brief outline of the development of wheat breeding in Canada from the introduction of Red Fife to the present time when Reward is regarded as a notable achievement, though still capable of further improvement.

555. 633.11:575(94.5)  
 633.13:575(94.5)  
 633.16:575(94.5)  
 633.1-2-1.521.6:575(94.5)

**State Research Farm, Werribee. Results of experiments.**

J. Dep. Agric. Vict. 1934 : 32 : 545-80.

At the research centre at Werribee a collection of some hundreds of varieties of wheats, oats and barleys from all the states of the Commonwealth and from other British and foreign sources is being used in breeding for yield, disease resistance, and quality in all three cereals and also for drought-resistance in wheat and oats.

*Wheat* : The six main varieties of wheat evolved are described and the technique employed for determining yield factors and for the "census" study of varietal differences is explained. Over 800 cross-breeds are undergoing infection tests and Ghurka and Rajah x Gallipoli appear to be highly resistant to flag smut (*Urocystis tritici*), while Forward, though inferior in yield, is resistant to loose smut (*Ustilago tritici*) and is being used in crosses with high yielding local varieties. Some hundreds of new hybrids obtained from crosses between the highest quality wheats from other countries and the best yielding Australian forms are being tested in field and laboratory for milling and baking quality.

*Oats* : Two new oats, Palestine and Dawn, have been produced, the former being a very early maturing, short strawed, drought-resistant and high yielding variety. Dawn represents a successful attempt to breed a variety suitable for early green fodder. Disease resistance and milling quality are being investigated on the same lines as wheat.

*Barley* : The improvement of yield in both malting (two-rowed) and fodder (six-rowed) types for Victoria conditions is expected to result from crosses between imported early maturing forms and local varieties. The yield from naked barleys is also receiving attention and the production of smooth awned forms is being studied. In all over 700 new hybrids are under trial in the stud cereal plots.

European varieties resistant to *Ustilago hordei* and *U. nuda* are being crossed with local types to obtain disease resistant forms.

High milling quality is expected to be obtained from the progeny derived from a number of English and Czecho-Slovakian barleys crossed with local forms of early maturing Indian types. Three or four hundred lines have been isolated and are undergoing trial.

A method of producing three generations of barley plants in each season is described.

556. McMILLAN, J. R. A. 633.11:575.11-181.13

**The inheritance of grass clumps in wheat.**

Rept. Aust. and N.Z. Ass. Adv. Sci. 1933 : 21 : 291 (Abst.).

From an analysis, not yet complete, of data derived from 580 wheat crosses with 155 varieties made during 1929-1931 at Canberra and from the records of other workers in Australia, it appears that the development of grass clumps is due to the interaction of a number of complementary genes of which 7 have been identified. At the same time other complementary genes, three of which have been isolated, have been found to inhibit clump formation. The genetic constitution of a number of varieties has been empirically determined on this basis and a group of testers for use in crosses to identify the genotype of other varieties is suggested.

557. HICKINBOTHAM, A. R. 633.11:664.641.016:575(94.2)

**The baking qualities of Australian wheats. No. 4. The quality of (a) commercial samples of South Australian wheat and (b) some pure lines of Ford.**

J. Dep. Agric. S. Aust. 1934 : 38 : 190-200.

A further paper (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 215) in which from an examination of commercial samples of wheat from important wheat growing districts it is inferred that the hereditary factor is the only one of major importance in determining quality in the wheat areas of South Australia. It also seems probable that varieties may contain different strains and are not yet fixed for quality and also that selection from certain established commercial varieties might yield stronger lines.

The samples were also used to determine whether vitreousness or hardness could be relied upon to indicate quality, but no association between these characteristics and quality could be found.

Tests of grain from a number of Ford lines shewed that the amount of protein bore little or no relation to the test number, but that the test number and specific quality were closely related and both appeared to be linked with small grain size.

A slight but distinct indication of a similar relation between grain size and quality was discovered in commercial samples of Nabawa and Sword.

## OATS 633.13

558. ROBB, W. 633.13:575

633.491:575

**Experimental oat and potato breeding. Some recent developments.**

Trans. Highl. Agric. Soc. Scot. 1934 : 46 : 126-45.

A general account of the principles underlying modern work on the improvement of oats and potatoes.

559. 633.13:575.242:581.162.32

AAMODT, O. S., JOHNSON, L. P. V. and MANSON, J. M.

**Natural and artificial hybridization of *Avena sativa* with *A. fatua* and its relation to the origin of fatuoids.**

Canad. J. Res. 1934 : 11 : 701-27.

The literature concerning the vexed question of the origin of fatuoids from natural crossing or from chromosome aberration or gene mutation is briefly reviewed.

The material investigated consisted of  $F_1$ ,  $F_2$  and  $F_3$  plants from an artificial cross between a white, awnless selection of *A. sativa* which had never been known to produce fatuoids and the wild oat *A. fatua*, and fatuoid forms the products of natural crossing occurring in elite stock of Victory and Banner oats.

The  $F_1$  of the artificial cross was more or less intermediate with regard to the main morphological characters. Dihybrid ratios were obtained in the segregation for lemma colour and a monohybrid ratio for rachilla pubescence. The four characters, lemma and callus pubescence, awn development, and articulation, which make up the characteristic fatuoid complex, each segregated in monohybrid ratios. Close linkage exists between these four characters which are regarded as a linkage group controlled either by a single complex gene or a closely linked group of genes. The factors for lemma colour are quite independent of this group.

On this basis the symbol *B* is assigned to the epistatic factor for black lemma colour, *G* to grey lemma colour, epistatic to *b* or *g* or both but hypostatic to *B*, and *W* to the fatuoid gene complex, so that *WW* produces *fatua* types, *Ww* intermediate and *ww* *sativa* types.

An analysis of the  $F_2$  data on this assumption shews a fairly close agreement with the expected. Three heterozygous fatuoid types and one homozygous fatuoid type appeared as Mendelian segregates from this cross and provide definite proof that such types can occur as the result of hybridization between *A. sativa* and *A. fatua*. A study of the wild aberrant types shewed that some of these were homozygous and others heterozygous and the segregating populations of the latter group correspond more or less closely to some of the types of segregation found in the  $F_3$  of the artificial cross.

These results lead the authors to the conviction that fatuoids do originate as a result of natural crossing between *A. sativa* and *A. fatua*, but they admit the possibility of their origin also by other means. The fact that in the field the fatuoid often occurs without any of the other expected segregates is accounted for by the fact that where selection is practised for the production of registered seed stocks, the black and grey segregates and the homozygous fatuoid types would be removed but the heterozygous fatuoid types may readily escape notice, especially if the variety is awned.

### BARLEY 633.16

560.

JOHNSTON, W. H.

633.16-2.451.2-1.521.6:575.11

633.16:581.48:578.088

**Studies on the dehulling of barley kernels with sulphuric acid and on the inheritance of reaction to covered smut *Ustilago hordei* (Pers.) K. and S. infection in crosses between Glabron and Trebi barleys.**

Canad. J. Res. 1934 : 11 : 458-73.

A method for removing the hulls of barley grains by treatment with sulphuric acid before inoculation is described. The result on germination was very unsatisfactory. Further investigations shewed that a complex of factors including mechanical injury before treatment and unfavourable conditions after sowing was responsible for this result.

Reciprocal crosses of Trebi, moderately susceptible to *U. hordei*, with Glabron which is highly resistant were used throughout the work and genetical studies were made on the  $F_3$ . Forms both as resistant and as susceptible as the parent varieties occurred but there was no evidence of transgression and the data are insufficient for an exact analysis. A study of correlations shewed a small but significant correlation between smut reaction and height of plant but none between earliness of heading or barbing of awns.

### MILLETS AND SORGHUMS 633.17

561.

RANGASWAMI AYYANGAR, G. N. and

633.17:581

PANDURANGA RAO, V.

633.17-2.112-1.521.6:575

**Studies in *Paspalum scrobiculatum*, L. The Kodo millet.**

Madras Agric. J. 1934 : 22 : 419-25.

A study of the botanical and agronomic characteristics and biology of *P. scrobiculatum*, with a brief description of the wild *P. sanguinale*. The latter surpasses *P. scrobiculatum* in drought resistance, number of seeds per head and other features which, with the absence of sterility, suggest that it might be used in crossing to improve *P. scrobiculatum* if the technical difficulties of pollination could be overcome.

562.

RANGASWAMI AYYANGER, G. M. and

633.174:575.11.061.6

SANKARA AYYAR, M. A.

**Striped plants in sorghum.**

Madras Agric. J. 1934 : 22 : 407-08.

Numerous instances of white or greenish yellow stripes in the leaves of sorghum seedlings, generally persisting in the subsequent stages of growth, are recorded. In one plant a resemblance to a sectorial chimaera was noted. A reduction in vigour and number of leaves and late flowering characterized striped plants as compared with normals from the same family.

Seeds from striped individuals usually gave green, yellow and albino seedlings; striped plants were few. The green and striped plants appeared to approximate roughly in numbers to the relative proportions of green and albino areas in the parent plants. In the ear head a localization of areas destined to produce albino and non-albino plants could be approximately discerned. (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 115).

563. RANGASWAMI AYYANGAR, G. N. and 633.174:581.331.2:575.243  
PANDURANGA RAO, V.  
**The effect of X-rays on sorghum pollen.**  
Madras Agric. J. 1934 : 22 : 448-49.

Pollen treated with various doses of X-rays shewed only slight differences in percentage germination but considerable differences in fertilization capacity, pollen after a five minutes' exposure giving a set of 41.7 per cent and after 10 or 15 minutes' exposure only 18 per cent. In the progeny obtained from treated pollen was a mutant in which the top eight leaf-blades were entirely suppressed.

### RICE 633.18

564. KASHI RAM and CHETTY, C. V. S. 633.18:575.061.6:581.46  
**The development of pigments in the glumes and apiculus of rice varieties.**  
Indian J. Agric. Sci. 1934 : 4 : 642-55.

The importance for classification of colour in parts of the rice plant, particularly in the spikelets, is pointed out. Certain varieties which otherwise appear similar can be distinguished by a study of the development of pigment, for some are characterized by a transient appearance of colour which fades away on the attainment of maturity. On the basis of this study, paddies are divided into straw, gold, olive, brown, purple and black groups. B.P.P.

565. RAMIAH, K., PARTHASARATHI, N. and 633.18:576.356.52:576.354.4  
RAMANUJAM, S.  
**A haploid plant in rice.**  
J. Indian Bot. Soc. 1934 : 13 : 153-64.

A full description of the cytology of the haploid already briefly noted (see "Plant Breeding Abstracts" Vol. III, Abst. 568).

566. KASHI RAM and CHETTY, C. V. S. 633.18(54.1)  
**The classification of the rices of Bihar and Orissa.**  
Indian J. Agric. Sci. 1934 : 4 : 618-41.

A collection of 123 types from various parts of Bihar and Orissa is classified. Stressing the value of qualitative and particularly the colour characters as criteria for the classification of rices, the primary divisions of the classification are based on the chemical constitution of the kernel, presence or absence of clustering in spikelets, presence or absence of double-grained spikelets, length of the outer glume and upon the absence or presence of elongated internodes such as occur in deep-water paddies. The subsequent divisions are based on the colour of the inner glume, apicules, outer glume, kernel and internode, in the order named. The ultimate classes are distinguished by differences in grain shape and size. B.P.P.

567. RAMIAH, K. and DHARMALINGAM, S. 633.18-2.183-1.521.6:575.11  
**Lodging of straw and its inheritance in rice (*Oryza sativa*).**  
Indian J. Agric. Sci. 1934 : 4 : 880-94.

Observations on a number of characters in several lodging and non-lodging varieties indicated that no one morphological character could be used as an index of standing power. Non-lodging varieties, however, were characterized by thick, persistent leaf-sheaths which closely enveloped the lower internodes, the latter having a relatively bigger diameter than lodging varieties.

A study of two crosses involving a non-lodging and two lodging varieties shewed that a single factor controlled the nature of straw, lodging being dominant to non-lodging. A further study revealed that tillering and flowering duration were associated with the straw character, the non-lodging plants having fewer tillers per plant and being definitely later in duration. No association was found, however, between standing ability and plant height or between the former and floret sterility. B.P.P.

### ROOTS AND TUBERS 633.4

568. BLACK, W. 633.491-2.412.5-1.521.6:575.11  
**Studies on the inheritance of resistance to wart disease [*Synchytrium endobioticum* (Schilb.) Perc.] in potatoes.**  
 J. Genet. 1935 : 30 : 127-46.

Resistance appears to be due to a natural physiological state probably determined by a number of factors; both resistant and susceptible varieties shew different degrees of resistance and susceptibility and the results of early works fail to agree as to the dominance or recessiveness of resistance. These facts have suggested the following scheme. Three factors are postulated for resistance to wart and to these is assigned a value representing the relative power of the contribution toward resistance, viz. A = 1, B = 2 and C = 3.

Sufficient resistance is only induced in the plant when the sum of the values is seven or over. Consequently the presence of at least two factors is required and a plant heterozygous for all three factors would be susceptible.

An examination of a number of progenies from the self-fertilization of resistant and of susceptible varieties and of hybrids between them and a re-examination of the results of some other workers offers satisfactory confirmation of the proposed scheme.

569. LUNDEN, A. P. and JØRSTAD, I. 633.491-2.412.5-1.521.6:575.11  
**Investigations on the inheritance of immunity to wart disease (*Synchytrium endobioticum* [Schilb.] Perc.) in the potato.**  
 J. Genet. 1934 : 29 : 375-85.

The main substance of this paper has already been published and is summarized in "Plant Breeding Abstracts" Vol. II, Abst. 648. The present edition omits the details of the method of infection but adds some results of further crosses.

### FIBRES 633.5

570. HARLAND, S. C. 633.51:575.116.1  
**Two cases of linkage in New World cottons.**  
 Trop. Agriculture, Trin. 1934 : 11 : p. 316.

Linkage, with a cross-over value of five per cent, has been found between the gene for green lint ( $G^1$ ) in *G. hirsutum* L. and the crinkled gene ( $cr$ ) which determines the recessive mutant known as Crinkled Dwarf in Sea Island cotton, *G. barbadense*, or as Wrinkled Leaf in Egyptian cotton. The other case of linkage studied was that already described by Thadani (1923) between red coloration ( $R^1$ ) and the cluster habit ( $cl^1$ ). The writer found a cross-over value of 13.9 per cent. The importance of these results lies in the ultimate possibility of transferring definite chromosome sections from one species to another and of the production of new types of economic value.

571. AFZAL, M. 633.51:575.242:581.48  
**A peculiar cotton plant.**  
 Curr. Sci. 1934 : 3 : p. 206.

Since the number of seeds in the locules of cotton is a character of some taxonomic importance, details are given of a supposed mutant plant found in a field of *Gossypium indicum* var. *Mollisoni* Gammie. Each lock had six or seven ovules but at its base only one mature seed and when the bolls matured there was only one sound seed in each loculus, the rest of the ovules being markedly shrivelled. Of the four seeds obtained three germinated well but all the seedlings died though not, in the writer's opinion, as a result of the action of genetic lethal factors.

572.

BAILEY, M. A.

**Leaf curl disease of cotton in the Sudan.**

Emp. Cott. Gr. Rev. 1934 : 11 : 280-88.

633.51:575.42(68)

633.51-2.8-1.521.6:575(68)

The selection work carried out in the search for a strain of cotton naturally resistant to the virus disease leaf curl in the Sudan is outlined. Ultimately individual plant selection among Sea Island strains, followed by crossing with Sakel and further continued selection has yielded a number of strains and sub-strains much more resistant than Sakel. Other types shewing a very promising degree of relative immunity were obtained by eliminating susceptible types from pre-existing selections.

Among various new strains two are worthy of special mention namely X 1530 and X 1730 which have not only the characteristics of the Sakel type from which the original selection was made but also possess outstanding vigour and fertility, combined with a very high resistance to leaf curl.

Hybridization work is also in progress with Sea Island cotton and a *peruvianum* cotton called "Ishan" which was imported from Nigeria and ultimately proved resistant to leaf curl and also (like the X strains) to the unfavourable seasonal conditions that occur in the Gezira in certain years. The potential results of this work are regarded as highly promising.

573.

HUTCHINSON, J. B. and GATES, R. R.

**The cytological study of cotton and its relatives.**

Emp. Cott. Gr. Rev. 1935 : 12 : 38-42.

633.51:576.16:576.356.5

In a letter to the Editor Mr. Hutchinson deploras the insistence of Prof. Ruggles Gates on the all-importance of cytological research in plant breeding (see "Plant Breeding Abstracts" Vol. V, Abst. 21) and points out that the practical plant breeder is able to assist materially the progress of a knowledge of the genetics of the plant by an accurate study of the results of hybridization experiments without the use of microscopical technique. He also questions the validity of the speculations of Prof. Gates as to origin of the New World cottons.

A memorandum received from Prof. Gates in reply and upholding his contentions is also printed.

## SUGAR PLANTS 633.6

574.

SRIVASTAVA, R. C.

**Review of the Sugar Industry of India.**

Indian Trade J. 1934 : 114 : (Suppl.) Pp. ii + 38.

633.61:575(54)

In the course of this review an account is given of the major developments in the production and spread of varieties since the establishment of the Imperial Sugar Cane Station at Coimbatore in 1913.

The seedlings there raised all pass under the designation of Co followed by a number. The spread of these seedlings has been so rapid and extensive that already some of the indigenous varieties are no longer to be found. Further, the earlier of the Co varieties to be established are already giving place to later productions. Thus, in the United Provinces, Co 213 is the most widely grown cane but is likely to be displaced by Co 300 and Co 312; Co 290, Co 301 and Co 313 are other seedlings receiving increasing recognition. An account of these developments is given for each Province. The main sugar tract of India lies in the extra-tropical Indo-Gangetic plain and the major effort has been directed to producing seedlings adapted to those conditions, but it is noted that success is attending the growth of the medium canes Co 213, Co 281 and Co 290 under the tropical conditions of Southern India.

Reference is also made to the cane-sorghum crosses of which Co 352 is the most promising, ripening in from six to seven months and maintaining its juice for three months without appreciable deterioration. The various forms of *Saccharum spontaneum* are being tested through the use of POJ 2725 as female parent. H.M.L.

575.

BELL, A. F.

633.61:575(94.3)

633.61-2-1.521.6(94.3)

**Results of disease resistance trials with sugar cane varieties.**

Cane Growers' Quart. Bull. 1934 : 2 : 44-46.

A great variety of imported canes from most countries of the world and a yearly average of about 25,000 new varieties raised as seedlings by the Bureau of Sugar Experiment Stations provide material for hybridization and the breeding of high yielding and disease resistant seedlings suitable for the three main climatic zones of Queensland.

The trials of resistance to gumming disease and also the combined resistance of certain varieties to one or more other diseases are shortly described with recommendations for growers.

576.

COTTRELL-DORMER, W.

633.61:575.1:576.312

633.61:575

**The mechanism of heredity. Its bearing on variety improvement.**

Proc. Qd. Soc. Sug. Cane Techn. 1934 : 207-20.

A presentation for the general reader of the main facts of genetics and its cytological basis. The value of the practical application of such knowledge to cane improvement is emphasized by reference to the achievements in cane breeding in Java.

577.

MUNGOMERY, R. W.

633.61-2.7-1.521.6

**The superiority of S.J. 4 over Badila in regard to beetle borer attack.**

Cane Growers' Quart. Bull. 1934 : 2 : p. 49.

The superior resistance of S.J. 4 to beetle borer attack as compared with Badila cane is recorded. S.J. 4 has a harder rind and a stronger and more vigorous rooting system and is therefore less susceptible to grub attack ; it is also less prone to lodging and over-maturity, both of which predispose canes to "sour" and hence to injury by beetle borers.

**STIMULANTS 633.7**

578.

BRIEGER, F. G.

633.71:575.127.2:575.11

633.71:575.116.1

**Genetic analysis of the cross between the self-fertile *Nicotiana Langsdorffii* and the self-sterile *N. Sanderae*.**

J. Genet. 1935 : 30 : 79-100.

The colour factors were mainly studied and the following have been identified : *c* a single recessive gene causing the absence of anthocyanin and related pigments is present in some *Sanderae* lines. All other *Sanderae* lines and those of *Langsdorffii* are *CC*.

A single factor *i* inhibits the development of anthocyanin on the upper surface of the petals and produces the ivory flower colour. In families segregating for both white and ivory colour *cc* is epistatic to all other anthocyanin factors, including *i* or *I*. The green colour of the flowers of *Langsdorffii* is due to one main dominant factor *G* but a number of deviations observed suggest that either special modifiers or complicated gene interactions are also involved.

The magenta flower colour present in most of the *Sanderae* types and in *Langsdorffii* is due to a single recessive gene *r*. Both mono- and dihybrid segregations were found in some of the back-cross families.

Two independent, dominant genes,  $B_1B_2$ , gave the blue pollen colour of *Langsdorffii*.

The crassa type, characterized by very narrow leaves and a peculiar habit of growth occurred in several  $F_2$  families and behaved as a simple recessive *cr*. As however, this type has never been known to occur in pure *Langsdorffii* or *Sanderae* the possibility that it may be due to a chromosome aberration is being investigated.

The following linkage relations were found : in chromosome I :  $S$ -(20 per cent)— $C$ -(0.5 per cent)— $B_1$  : in chromosome II :  $I$ -(20 per cent)— $B_2$  (10 per cent)— $Cr$ . The genes *G* and *R* were independent.

Deviations between the figures found and expected suggest the presence of factors modifying the ratios and cytological investigations made during the course of publication have already shewn that certain chromosome irregularities are present which may provide an explanation.

579. GOODSPEED, T. H. and AVERY, P. 633.71:575.129:576.356  
**The cytogenetics of fourteen types derived from a single X-rayed sex cell of *Nicotiana Tabacum*.**  
 J. Genet. 1934 : 29 : 327-53.

The external morphology and the cytology of seven pure-breeding derivative types and seven types not yet constant from a variant  $X_1$  plant are described. They showed distinct differences in habit, leaf, flower, etc., and in one case the variation was great enough for specific rank. The origin of these types is discussed and it is assumed that transgenations, homozygous deficiencies, duplications and probably translocations have played a part in their production.

580. LAMMERTS, W. E. 633.71:575.129:576.356  
**Derivative types obtained by back-crossing *Nicotiana rustica-paniculata* to *N. paniculata*.**  
 J. Genet. 1934 : 29 : 355-66.

In a study, to be published shortly, of the derivative types obtained by continuous back-crossing of the *N. rustica-paniculata* hybrid to *N. rustica pumila*, it was found that they behaved mostly as simple dominants when crossed with *pumila*. The present paper deals with a comparable series of derivatives obtained by back-crossing the hybrid to *N. paniculata*. Data on the frequency distribution of chromosome numbers in the back-cross progeny showed that the average number of univalents transmitted was 1.35.

The plants of the second and third back-cross progenies mostly resembled *N. paniculata*, but on selfing those which were pollen fertile a number of types distinct from *paniculata* but with the same chromosome number were obtained. True breeding lines were eventually established and twelve types are described, some of which possess desirable characteristics not found in either parent. Crossing the types with one another and back-crossing to the normal *paniculata* type showed that in every case the derivative type was recessive. Genetical analysis showed that two were allelomorphic. The possible origin of these recessive derivative types is discussed and it is concluded that there has occurred a rather infrequent type of crossing-over between homologous chromosomes leading to the substitution of chromosome segments. The further interaction of these segments with an otherwise normal *paniculata* complex results often in deficiency-duplication gametes. The observed  $F_1$  sterility would also result from such non-homologous crossing-over.

581. 633.71:576.356.5:575-181.13  
**Production of dwarf amphidiploid tobacco plants.**  
 Nature, Lond. 1934 : 134 : p. 1013.

It is reported that the author has crossed *N. glauca* ( $2n = 24$ ) with *N. rustica* var. *humilis* ( $2n = 48$ ) and obtained inviable embryos; in crosses with *N. rustica* var. *texana* ( $2n = 48$ ) on the other hand viable but self-sterile hybrids with irregular meiosis were obtained. In back-crosses with *N. rustica* var. *humilis* or *texana* plants with 48-96 chromosomes occurred. Two of these were dwarf tetraploids with 72 chromosomes. This is a case in which reduction in size and vitality have resulted from chromosome doubling.

582. 633.73:575(54.8)  
 COLEMAN, L. C. 632.452:576.16:633.73  
**The coffee-planting industry in South India.**  
 Emp. J. Exp. Agric. 1934 : 2 : 303-14.

Though during the past twenty years *Coffea robusta* has tended to replace *C. arabica* in plantations, breeding experiments at the Mysore Coffee Experiment Station hold out great promise of producing much more vigorous and disease resistant strains of *C. arabica* and also hybrids adapted to more varied conditions of soil and climate than is possible at present.

The work and organization of the Mysore Station is outlined. In plant breeding most attention has been given to the selection and hybridization of *C. arabica*, but selection has also been carried out on *C. robusta* and may soon be extended to promising races of *C. congensis* and *C. uganda* in the Station's collections.

Work on diseases has established the existence of two physiological strains of *Hemileia*, to one of which the valuable hybrid Kent *arabica* is highly resistant.

The development of variety testing and breeding done by the Station and by individual planters is outlined. The hybrid types obtained by crossing *C. arabica* and *C. liberica* (though of little value for plantation purposes) should with some artificially produced *arabica* x *robusta* hybrids, and a large collection of arabica types in cultivation and the progeny of selected *arabica* trees on estates over the whole of Southern India, provide useful breeding material. The purification of this wealth of material has been one of the Station's main tasks during the past five years and a fair degree of purity may be attained within the next five or six years. In the meantime forms cross-pollinated by selected Kent *arabica* plants are being used with the hope of obtaining valuable strains of coffee in about ten years' time, the main object being to combine high quality and yield with increased vigour and disease resistance. Initial results seem to suggest that resistance to *Hemileia vastatrix* is dominant to susceptibility and segregates in a relatively simple manner.

#### AROMATIC PLANTS, SPICES, ETC. 633.81/4

583. FRASER, J. 633.822:575.12:575.252  
**Mints that sport.**  
 Rep. Bot. Soc. Exch. Cl. Brit. Isles 1934 : 10 : 589-91.

Instances of vegetative sporting in a number of hybrid mints are recorded and described.

#### OIL PLANTS 633.85

584. JAGOE, R. B. 633.855.34:581.162.3  
**Observations and experiments in connection with pollination of oil palms.**  
 Malay. Agric. J. 1934 : 22 : 598-606.

The conclusion is reached that the oil palm is entirely wind pollinated and though the possibility of insect pollination is not excluded its effect is negligible.

Large plantations sufficiently exposed to the prevailing winds offer adequate opportunities for the pollination of mature trees.

The possibility that artificial pollination may increase the yield of young palms but at the same time may adversely affect their mature yields is very briefly discussed.

#### FRUIT TREES 634

585. CURTIS, K. M. 634.11-2.3-1.521.6:575(93.1)  
 634.13-2.3-1.521.6:575(93.1)  
**Fireblight. A survey of current knowledge and recent advances.**  
 Orchard N.Z. 1934 : Pp. 8.

The open blossom of nearly all commercial pome fruits is highly susceptible to fireblight [*Bacillus amylovorus* (Burr.) Trev.]. In general pear scions are more susceptible than apple scions. The hybrid variety Kieffer differs in its reaction to fireblight according to whether the resistant or the susceptible parent dominates in the strain.

In apple scions the crab type is usually regarded as definitely susceptible and the ordinary commercial type as moderately resistant. So far selection for resistance has not been possible with scions ; but root and body-stocks seem to offer greater promise of success, judging from the results obtained at the U.S.A. Fireblight Research Station.

586. MOFFETT, A. A. 634.13:576.356.5:581.331.23  
**Chromosome number and pollen germination in pears.**  
 J. Pomol. 1934 : 12 : 321-26.

The object of this investigation was to discover the extent of triploidy in cultivated varieties of pears and whether, as in apples, there was sharp distinction into two classes according to pollen infertility.

Out of thirty-four varieties examined twenty-seven were diploids and seven triploids. The diploids shewed considerable variation in pollen germination but on the whole they shewed a much higher percentage germination than the triploids, which are generally recognized as having a low germination capacity. The difference is not however as clear cut as in apples. (Cf. " Plant Breeding Abstracts " Vol. V, Abst. 162.)

587. MAGEE, C. J. 634.771:575.252  
**Variegated banana.**  
 SUAGA (Bull. Sidney Univ. Agric. Graduates' Ass.) 1934 : Issue No. 16 :  
 p. 30.

A banana plant with variegated leaves, probably a bud mutation, is described.

588. CHEESMAN, E. E. and LARTER, L. N. H. 634.771:576.312.35  
**Genetical and cytological studies of *Musa*. III. Chromosome numbers  
 in the Musaceae.**  
 J. Genet. 1935 : 30 : 31-52.

Of twenty-nine fertile varieties of *Eumusa* representing seventeen distinct varieties belonging to six taxonomic species, all but two had  $22 = 2n$  chromosomes. The two exceptions, the only two varieties of *M. textilis*, had  $20 = 2n$ .

Ninety-two sterile clones of *Eumusa* were also examined. At least twenty-seven distinct varieties were represented. Eighty-one were triploids  $2n = 33$ , nine were diploids  $2n = 22$ , one had  $2n = 32$  and the other had  $2n = 34$  and had clearly arisen through fragmentation.

Previous conclusions that the basic haploid number in the *Eumusa* is 11 are therefore further confirmed. In the other sections of *Musa*, *M. Ensete* of the sub-genus *Physocaulis* shewed  $2n = 18$ , in three species of *Rhodochlamys*  $2n = 20$ . Counts were also made on species of *Strelitzia*, *Heliconia* and *Ravenala* and the possible relationships of these with *Musa* are briefly discussed.

#### FORESTRY 634.9

589. 634.97:575(54)  
 634.97-1.531.12  
**The importance of the origin of seed used in forestry.**  
 Indian For. 1933 : 59 : 197-200.

The importance of raising forest trees only from the progeny of the best types of mother trees is again emphasized by reference to the report, previously reviewed in "Plant Breeding Abstracts" Vol. IV, Abst. 589.

#### VEGETABLES 635

590. OLDHAM, C. H. 635.356:575(42)  
**The broccoli industry.**  
 J. Minist. Agric. 1935 : 41 : 1063-69.

In order to eliminate the impure types resulting from chance cross-fertilization in the Roscoff broccoli grown in Cornwall, breeding centres for improved strains were established some years ago at the Seale-Hayne Agricultural College and at the Horticultural Research Station, Cambridge, with good results. At the latter station too an attempt is being made to produce a hardier type of Roscoff and also strains to "head in" at definite periods from early January onwards.

591. PASSMORE, S. F. 635.62:575.125  
**Hybrid vigour in reciprocal crosses in *Cucurbita Pepo*.**  
 Ann. Bot. Lond. 1934 : 48 : 1029-39.

Data from two reciprocal crosses between big-seeded and small-seeded inbred pure lines of *C. Pepo* shew that the hybrids from the larger embryos are markedly larger during early development but that this difference becomes much less at a later stage and the plants from small embryos tend to catch up with those from large ones. After nine weeks' growth though the differences in the number of fruits and in weight of plant in the two types are still probably significant differences in leaf number and leaf area have ceased to be so.

The ultimate size attained by the two hybrids from a reciprocal cross is the same, but the one with the larger embryo reaches the limit first, though growing more slowly in the latter stages than the plant from the smaller embryo.

Hence in any investigation of hybrid vigour it is important to consider not only initial size but also duration of growth.

592. RANGASWAMI AYYANGAR, G. N., KRISHNA RAO, P., and SESHADRI SARMA, P. 635.654  
635.654:575.11.061.6

**Preliminary studies in horse-gram. (*Dolichos biflorus*, L.)**

Madras Agric. J. 1934 : 22 : 200-04.

A description of the plant. Two types of purple pigmentation  $F_1$  and  $F_2$  commonly occur, and the data obtained from natural crosses indicate a single factor difference between them.

593. DAVE, B. B. 635.659:575.11.061.6

**Inheritance of characters in *Cajanus indicus*.**

Indian J. Agric. Sci. 1934 : 4 : 674-91.

The mode of inheritance of flower, pod and seed coat colours was studied. Flower colours concerned were (a) orange yellow (b) yellow, back of standard with self-coloured veins (c) yellow, back of standard purple (d) yellow, back of standard with red veins (e) yellow, back of standard with purple veins, base diffused purple. The following segregations were obtained in  $F_2$ : (b) x (a) = 3(a) : 1(b), (b) x (c) = 3(c) : 1(b) and 9(c) : 7(b), (d) x (a) = 3(a) : 1(d), (e) x (c) = 3(c) : 1(e), (a) x (c) = (dorsal side) 12 purple : 3 orange : 1 yellow and (ventral side) 3 orange : 1 yellow. The results are explained as being due to the action and interaction of 5 factors, *P*, *A*, *C*, *E* and *V*.

Maroon-blotched pod colour is dominant to green, and "dark" is dominant to maroon-blotched, on a monogenic basis. Green x "dark" gave the ratio 9 dark : 3 maroon-blotched : 4 green, in  $F_2$ . *L* is assumed to be the factor for maroon-blotching and *D*, which acts only in the presence of *L*, extends the colour all over the pod.

Brown seed-coat colour is dominant to white, and purplish black to brown, with a 3 : 1 ratio. White x purplish black gave the ratio of 9 purplish black : 3 white with purplish black spots : 3 brown : 1 white. The factors *P* and *R* are responsible for purplish black spotting and brown colour respectively, their concurrent presence giving purplish black. In the absence of both *P* and *R* the seed coat is white.

There is a complete linkage between flowers of type (a) and purplish black seeds and between flowers of type (c) and green pods, and close linkage between flowers of type (c) and maroon-blotched pods. B. P. P.

594. KELKAR, S. G. and PANDYA, P. S. 635.659:581.162.31:578.08

**A new method of selfing "tur" (*Cajanus indicus*) flowers.**

Poona Agric. Coll. Mag. 1934 : 26 : 108-11.

After various methods were tried and rejected, a new technique for selfing *Cajanus indicus* by smearing the bud from the calyx to the tip of the standard with melted candle wax was found and is here described.

## Part II. Foreign.

### GENETICS 575

595. SAMPAIO, A. J. de 575.1  
 Genética e sistemática experimental do cafeeiro e das plantas superiores em geral. (**Genetics and experimental systematics of coffee and of the higher plants in general.**)

Rev. Dep. Nac. Café, Rio de J. 1934 : 2 : 921-23; 1935 : 2 : 11-14.

A brief review is given of the three genetical papers read at the First Brazilian Congress of Eugenics 1929; the first is entitled "O estado atual do problema da hereditariedade" (The present position of the problem of heredity) by André Dreyfus, pages 87-97. The author traces the main developments of genetical theory from Mendel's work to the present day, ending with the conclusion that mutation is the only factor which comes near to explaining the evolution of species.

The second paper is entitled "Biométrica," by Fernando R. da Silveira and gives a general review of the science of biometry. The third, by A. J. de Sampaio, entitled "Genética Vegetal," discusses the several ways in which plant genetics can be put to practical value, under the heads (1) improvement of cultural methods (2) improvement of the race (3) crosses and (4) artificial maintenance of the improved types. Plant breeding should aim at an increased quality of product, yield, resistance to diseases, pests and unfavourable climatic influences, extended period of ripening by the production of earlier and later varieties, an increase in the spacing at which cultivation is possible so as to simplify the harvest, and lastly the creation of forms suitable for cultivation on new or inferior areas.

596. WELLENSIEK, S. J. 575.1  
**Notes on genic symbolization.**  
 Genetica 1934 : 16 : 521-23.

Further detailed suggestions on the proposed international agreement on the use of symbols for genes. (Cf. "Plant Breeding Abstracts" Vol. IV, Abst. 352.)

597. 575.1:576.356.5  
 FLOVIK, K. 633:575:576.312  
 Planteforedling på cytologisk basis. (**Plant breeding on a cytological basis.**)  
 Tidsskr. Norske Landbr. 1934 : 41 : 295-304.

A survey of recent advances in plant breeding with special reference to the various aspects of polyploidy and chromosome fragmentation.

A bibliography of representative papers is included.

598. 575.116.4  
575.17

#### **Genes and chromosomes.**

Science 1934 : 80 : (Suppl.) p. 8.

By the aid of X-ray bombardment to induce mutation and by a new chromosome staining technique Professor Muller and Dr. Prokofyeva working in Leningrad, have succeeded in tracing certain genes to individual chromomeres. The smallest particle of chromosome substance used in the investigation was about one-sixteenth millionths of an inch in diameter yet it contained several genes. It is hoped that ultimately particles so small that they can contain only one gene apiece may be detached and used to measure the size of the individual gene.

599.

575.17

575.116.4

576.312.32:578.08

(1) PAINTER, T. S.

**Salivary chromosomes and the attack on the gene.**

J. Hered. 1934 : 25 : 465-76.

(2)

**Discovery of " position effect " through use of salivary gland material.**

J. Hered. 1934 : 25 : p. 476.

(3) METZ, C. W. and GAY, E. H.

**Chromosome structure in the salivary glands of *Sciara*.**

Science 1934 : 80 : 595-96.

(4) METZ, C. W. and GAY, E. H.

**Organization of salivary gland chromosomes in *Sciara* in relation to the genes.**

Proc. Nat. Acad. Sci. Wash. 1934 : 20 : 617-21.

According to Dr. Painter's report, owing to their large size and distinctive banded markings the chromosomes of the salivary glands of the Diptera larvae have provided an invaluable tool for the cytological study of chromosome structure and possibly for the ultimate identification of the gene.

These broad or narrow and light or dark striations which appear like circular surface bands round the chromosomes have been found to form a pattern characteristic for a given element. By analysing the results of short deletions to discover what genes were absent it has been possible to relate the missing genes with the absence of certain bands (or parts of bands) on the chromosome, though the actual site of the gene—whether within the chromosome or on its surface—has not yet been discovered by this method.

The history and progress of this line of research which may ultimately lead to the identification of the gene is fully described. The value of the new technique and the theory of somatic synapsis upon which it is partly based are described and their bearings on other problems such as crossing-over, chromosome aberrations, etc. are indicated.

The salivary chromosomes were also used in the detection of position effect (i.e. the effect of propinquity of genes upon their expression) by Muller and Prokofyeva whose recent work on the identification of the gene is described in (2) above.

The third and fourth papers deal with the details of chromosome structure in the salivary gland chromosomes.

600. MICHAELIS, P.

575.182

**Weitere Untersuchungen über das Problem der Plasmavererbung. (Further studies on the problem of plasma inheritance.)**

Züchter 1934 : 6 : 303-08.

The plasma may affect inheritance either by the presence in it of structures similar to the genes in the nucleus or it may form a specific substratum for the reaction of the nuclear genes.

The results of experiments with reciprocal crosses of *Epilobium* are discussed in this connexion and it is shewn that though the first possibility is not excluded there is evidence for the view that the plasma represents a genetically independent, specific substratum for the genes ; and that it is not the whole nucleus but individual genes or groups of genes that are affected.

Experiments on the physiological effects of the foreign plasma on the young plant shew that abnormalities occur in the seedling which cannot be traced to any effect of the genes. Similarly, certain genotypically well defined male gametes die off in the foreign plasma while in plasma of their own species they are perfectly viable. Differences between the plants with foreign plasma can also be detected when they are grown under unfavourable nutritive conditions.

None of these results contradict the hypothesis that the plasma is, in chemical composition and physical structure, a specific substratum and at present they offer no support for the theory of the plasma as the carrier of the gene-like structures.

The plasma may be of importance to phylogeny in two ways. Either by a change in the plasma itself the reaction of the genes may be modified and the phenotype changed or there exists the possibility of a change in the mutation rate in different plasma. Researches in proof of these hypotheses are in progress.

601. STUBBE, H. 575.24  
Die Bedeutung der Mutation in der Vererbungsforschung. (**The importance of mutation in the study of heredity.**)  
Umschau 1934 : 38 : 1010-12.

A brief outline is given of the nature of mutations, in which reference is made to the inadequacy of natural radiation and temperature changes to account for the mutations that occur in nature. It is suggested that some internal processes must also exist which are responsible for producing natural mutations. A study of labile genes suggests that these processes are of the nature of physico-chemical alterations of the structure of the gene molecules. Many mutants are now known which are in themselves insignificant but which under certain conditions or in combination with certain other factors make the individual more viable than the normal. It is in ways such as these that the many and various existing forms and probably even species have come into existence.

The danger of injuring the germ cells when experimenting with X-rays is mentioned in a note of warning at the end of the article.

602. STUBBE, H. 575.24  
Die Bedeutung der Mutationen für die theoretische und angewandte Genetik.  
(**The importance of mutations for theoretical and applied genetics.**)  
Naturwissenschaften 1934 : 22 : 781-87.

The present state of knowledge of the phenomenon of mutation is briefly reviewed and by reference to a series of allelomorphs any one of which may mutate into any other, the author suggests that mutations are structural alterations in the genic material rather than quantitative alterations such as losses and gains.

All the known geographical and specific differences in *Antirrhinum* have been shewn to be derived from an accumulation of small mutations such as have been observed to occur naturally ; and there is now no doubt that natural mutation is sufficient to afford the genetic variation on which natural selection works in the origin of species.

Cases are quoted in which mutant genes have a higher selection value than the normal and others in which combined with other genes they have a selection value, though not alone. Many of the most valued characters in cultivated plants are pathological in nature, just such characters as occur by mutation. Moreover, many of the mutant characters obtained in *Antirrhinum* would be extremely valuable in cultivated plants, e.g., early maturity, tallness, unbranched habit, etc., and attempts are now being made to produce valuable artificial mutations in a number of cultivated plants.

Attention is called to the danger of new races of fungi arising by mutation.

603. KÜHN, A. 575.24:576.16  
Vererbungsphysiologie und Artumwandlung. (**The physiology of inheritance and the evolution of species.**)  
Umschau 1934 : 38 : 769-72.

Few mutant genes affect morphological characters alone without having some influence on the viability or adaptation of the organism to certain conditions of environment. It is in this way that the innumerable geographical races, each adapted to its environment, have arisen.

604. STUBBE, H. 575.242  
Einige Kleinmutationen von *Antirrhinum majus* L. (**Some minor mutations of *A. majus* L.**)  
Züchter 1934 : 6 : 299-303.

A number of minor mutations involving flower colour and shape are figured and described and their value for breeding is discussed.

605. STEIN, E. 575.73:539.16  
Erbliche, durch Radiumbestrahlung erzeugte Entartung. (**Hereditary degeneration produced by irradiation from radium.**)  
Umschau 1934 : 38 : 796-97.

A description is given of a pathological condition resembling animal cancer resulting from radium irradiation in a plant at an early stage. The condition is inheritable.

606. McCLINTOCK, B. 576.312.31.5:633.15  
**The relation of a particular chromosomal element to the development of the nucleoli in *Zea mays*.**  
 Z. Zellforsch. 1934 : 21 : 294-328.

An interchange was obtained which divided into two the dark-staining body of chromosome 6 adjacent to the nucleolus and the result was that each half was capable of producing a separate nucleolus. Thus in place of two, four nucleoli were formed in the somatic cells of individuals homozygous for the interchange, two of these being large and two small. Moreover the larger nucleoli were invariably produced by the chromosomes with the smaller section of the body, which is the section that is in normal cells most closely attached to the nucleolus, suggesting that this section has a greater functional capacity in organizing the nucleolus than the remaining section.

In plants heterozygous for the interchange the maximum number of nucleoli observed in the somatic nuclei was three, two large and one small.

The distribution of the different chromosomes in a number of microspores is described. Spores with both interchange chromosomes, with none and with one of each type occurred. When the large section was present alone it produced a large nucleolus, though when together with the small section it again produced a small one. The spores containing the chromosome with the small section on the other hand had a large number of scattered nucleoli associated with any and every member of the 10 chromosomes, two slightly larger than the rest being present. There were approximately 25 per cent of each of the four types of spores.

The formation of a number of small nucleolus-like bodies has been observed also in cells deficient for the nucleolus-organizing segment and it seems that in the absence of this segment the nucleolar substance produced by each chromosome is extruded in the form of droplets by the individual chromosomes. The function of the nucleolar-organizing segment seems to be to direct this material into one central body, the nucleolus. Appearances suggest that the material so extruded is the matrix of the chromosomes. The almost entire failure to function on the part of the small section of the nucleolar-organizing segment in the present instance is ascribed to a deficiency in this interchange type.

At telophase of normal plants two nucleoli are invariably formed, which may later fuse. In trisomics for chromosome 6 three nucleoli are present, two or all of which may fuse. In these cases however the nucleoli do not differ in size.

607. LEVITSKY, G. A., ŠEPELEVA, E. M. and TITOVA, N. N. 576.312.36:537.531  
**(New karyotypic races obtained from the progeny of X-rayed plants.)**  
 Bull. Appl. Bot. Leningrad 1934 : Ser. A(11) : 113-18.

From the plants produced by a number of X-rayed seedlings of *Crepis capillaris* 23 were clearly of an aberrant type. They were allowed to set seed by free pollination and 272 of the  $F_1$  plants so obtained were investigated. Of these, 46 showed cytological irregularities, i.e. about 17 per cent. Often all the plants produced from a single X-rayed individual displayed identical karyotypic alterations. This is because changes occurring in the cells of the X-rayed seedlings are perpetuated in succeeding divisions of the cell in question and so there arises a whole sector of the plant all the cells of which have identical irregularities and thus breed true. In the more rapid production of homozygous variants this method is better than the method of treating the flower buds.

The karyotypic irregularities included translocations between chromosomes and a case where the relative lengths of the two arms of one of the chromosomes of a pair were altered, the other member of the pair remaining unchanged. Pairing was perfectly normal at meiosis and the conclusion is made that only the position of the constriction had changed. In another sib, fragmentation occurred in one chromosome pair and one member of the pair remained without a constriction but nevertheless continued to divide and move normally at meiosis. A fine thread is often seen uniting the two fragments however and it is thought that this is always present and that the union of the large fragment without a constriction with the small fragment accounts for its normal behaviour. In certain somatic cells moreover the large fragment did fail to move to the pole, as if the connecting thread in this case had actually broken.

The  $F_1$  plants were allowed to self-pollinate and identical plants were also intercrossed. In 1933 the  $F_3$  plants were obtained and among these there were a number of plants homozygous for an inversion, caused by the detachment of a chromosome fragment and its attachment again at an angle of  $180^\circ$ , a phenomenon cytologically demonstrated for the first time. Homozygous lines of the various aberrant karyotypes are being multiplied so as to study the phenotypical expression of the different irregularities.

608. KIHARA, H. and LILIENFELD, F. 576.312.4  
 633.11:575.127.5:633.11 *Aegilops* : 576.312  
 Kerneinwanderung und Bildung syndiploider Pollenmutterzellen bei dem  
 $F_1$ -Bastard *Triticum aegilopoides* x *Aegilops squarrosa*. (Nuclear migration  
 and the formation of syndiploid pollen mother cells in the  $F_1$  hybrid  
*T. aegilopoides* and *Ae. squarrosa*.)  
 Jap. J. Genet. 1934 : 10 : Pp. 28.

Two types of nuclear migrations are distinguished, one, the migration of structureless chromatin globules, for which the term cytomixis is reserved and the other, in which the whole nucleus migrates to another cell so leading to the formation of diploid gametes.

Both these types are described in the hybrid concerned.

There were also indications of nuclear migration in the pollen mother cells of *T. aegilopoides*.

609. MATHER, K. and LAMM, R. 576.354.46:519.241.1  
 The negative correlation of chiasma frequencies.  
 Hereditas, Lund 1935 : 20 : 65-70.

The data on the frequency distribution of chiasma formation in the bivalents and cells of *Secale* and *Vicia* are examined and further evidence is briefly summarized for the negative correlation of the frequencies of crossing-over and chiasma formation in bivalents in the same cells, which adds support to the chiasmotype theory of chiasma formation.

610. BLEIER, H. 576.356:575.127(016)  
 Bastardkaryologie. (Hybrid karyology.)  
 Bibliogr. Genet. 1934 : 11 : 393-489.

A bibliographical monograph reviewing the present position of research on hybrids displaying irregular chromosome behaviour. The results of the most important authors are mentioned and discussed, a list of references covering twenty pages is provided, together with a table shewing the genera in which hybrids with irregular chromosome behaviour are known, the chromosome numbers of the parental species, the nature of the chromosome pairing in  $F_1$ , the behaviour of the univalents when present, and the authors who have made the observations. Other tables shew the cases in which chromosome duplication has been observed, cases of hybridization between three species and between polyploids of the same species.

An index completes the work.

611. LOEHWING, W. F. 577.81  
 577.88  
 577.84  
 The experimental production and physiological characteristics of  
 hermaphrodite and monoecious plants in certain normally dioecious  
 species.  
 Amer. J. Bot. 1934 : 21 : p. 709.

Methods are given of experimentally inducing the functional development of staminate and pistillate primordia in the same flower of several normally dioecious species.

Sex ratios in the progeny of self and cross-pollinated parents and physiological differences between normal unisexual and experimentally induced bisexual plants are discussed.

612. BOONSTRA, A. E. H. R.

581.1:575:633

Physiologisch onderzoek ten dienste van de plantenveredeling. (**Physiological research in the service of plant breeding.**)

Meded. LandbHoogesch. Wageningen 1934 : 38(1) : Pp. 99.

The problem which forms the background of this paper is the possibility of obtaining by crossing two races (i.e. pure lines) of a self-pollinating plant (e.g. rye) a new variety with a higher yield than the parent forms.

The well-known genetic difficulties of breeding for a complex character such as yield, dependent on the interaction of large numbers of genes, are discussed, together with questions of technique in plot tests.

The main portion of the paper deals with the new line in plant breeding that may be opened up with the systematic investigation of the direct cause of high and low yield—an essentially physiological problem though yield is admittedly also indirectly due to genetic causes (operating with environmental factors).

The fallacy of regarding an analysis of yield into its components, number of plants per m<sup>2</sup>, number of ears per plant, number of grains per ear, average grain weight, etc. as the equivalent of determining the causes of the size of yield is demonstrated and attention is also drawn to the frequent invalid use of deductions based on correlation coefficients. In the author's view the cause of differences in yield must be sought by comparative studies of metabolic processes (e.g. assimilation, absorption, transpiration, etc.) of the races in question; and in order to breed a race with a higher productive capacity it is first necessary to compare these various components of the functional activity of two races; then, having ascertained the differences in function, to attempt by a race cross to unite in one plant a combination of the desirable functional characteristics of each race. Whether this gradual incorporation of the desired physiological characters in one race by continued crossing is possible in practice still remains to be proved.

Difficulties of technique and the chances of success from various methods of hybridization are discussed with suggestions.

In order to exclude the factor of chance as far as possible, judicious selection is essential both of the initial material and the newly formed races, and above all of the races to be crossed, since the new gene combinations that may segregate out depend upon this choice; and the observations on which selection is based should not be limited to external characters but should include a thorough preliminary study of the internal and especially the physiological characters. It is suggested that about 10 different types of outstanding yield should be systematically studied for differences in assimilation, absorption, respiration and other functions, as exhibited in the plant as a whole and not as isolated characters. Varieties thus thoroughly studied could then be used by the practical breeder either for crossing *inter se* or with some varieties he has chosen by the ordinary methods. The number of varieties undergoing such preliminary investigation could be gradually increased and well might include foreign types or pure lines from land races as a valuable source of breeding material.

The elaboration of suitable methods is all-important in deciding whether selection for physiological characters in the material obtained by crossing is possible. Of recent years such characters have received more attention and the author points out that the monograph published in 1926 by Biffen and Engledow and Riede's paper in 1927 contained the main theories in the exposition under review.

The author's own analysis of differences between the root systems of seven varieties of peas in relation to differences in yield is used to shew that the suggested sounder basis for plant breeding, based on physiological characters is actually capable of realization. The unit used in estimating the differences was based on the functional performance of the root, as determined by a comparison of the number of units of the aerial parts of the plant that are supplied with the necessary inorganic substances by one unit of the root system. The unit selected was 1 g. of dry substance and the relation between the number of grammes of dry substance of the aerial points and of the root system at the time of harvesting was thus a measure of the "root value" (i.e. effectiveness) and allowed of comparison of the root system of one plant with that of others. The reason for any differences thus found could then be further examined to ascertain which of the various

functional processes is responsible for the greater efficiency in the supply of nutrients or whether it depends on structural differences.

In the experimental pea varieties wide differences in root size and value were found and also a relationship between root value and depth of penetration of the soil. Experimental elimination of differences in the conditions of nutrition and re-determination of the root value shewed both it and root size to be varietal characters.

A consideration of root function suggested that differences in activity might be related to the surface area of the root (i.e. the absorption surface) and the formula length of root  $\times 2p \ r^2 \times s.g.$  was used as the basis of a test, the results of which shewed that under the experimental conditions the greater root value was clearly correlated with a higher in-take of water and salts per gramme of root; it was also found that the varieties differed further in the ratio of water to ash absorbed though since here no general relationship could be established it is concluded that other causal factors too must be operating.

In general the differences in the root value and also in the amounts of water and ash in-take were found to increase with the age of the plants.

The permeability to potassium nitrate was also investigated in the different varieties, using Lundegårdh's technique and a hypertonic solution of the salt; and from the results (which were however not conclusive) it seemed probable that the root tips of certain varieties had a higher permeability to potassium nitrate as compared with others. Permeability to water was also determined and differences among the varieties observed.

Now it is evident that these physiological differences which must be regarded as heritable are naturally influenced by external conditions and that varieties react differently to changes in environment. Experiments on the influence of the moisture content of the soil, the concentration of the nutrient solution and the temperature of the root system shewed that there was increased activity of the root with increased moisture content, salt concentration and temperature and the response was qualitatively in the same direction in the varieties tested though quantitatively there were marked individual differences in the varieties.

It is concluded that the variations in root activity, permeability, etc., discussed are varietal characters and not due to chance environmental factors—a finding of considerable practical importance to plant breeding.

Full details of the methods and technique used and of the underlying principles are given throughout. A full bibliography of the relevant literature is appended.

613.     \*HOEK, S. VAN 581.143.26.03  
           Enige waarnemingen omtrent jarowisatie. (**Certain observations on**  
           **vernalization.**)  
           Landbouwk. Tijdschr. Wageningen 1934 : 46 : 809-14.

After the publication of Lyssenko's method of vernalization, experiments were made on van Hoek spring wheat, 3 varieties of soya bean, *Sorghum exiguum* and Red Star potatoes.

The wheat was treated in the way described in the bulletin of the Imperial Bureau of Plant Genetics and other early publications, chilling being carried out in an ice chest at 3-6°C., one lot for 7 days and another for 16 days. In the 7 day treatment the germination was more rapid in the treated seeds. The size of the plants was greater, especially in the early stages. In average beginning of earing and flowering the treated plants were a day ahead, and more ahead in the time at which isolated plants began. There was a difference in maturity of about four days. In the 16 day treatment the difference in size was much more pronounced than in the shorter treatment and in this case the treated plants were 3 days before the control in date of average earing. In maturity they were estimated as 1-4 days earlier. The length of the ears was increased by the treatment. The longer treatment was clearly the more successful and it is desirable that still longer treatments be tried.

The soya beans were treated for 10-15 days in the dark at a temperature of 20-25°C. Neither treated nor untreated plants flowered, the treated being less vigorous vegetatively however,

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\* A full summary of this paper is on file at the Bureau.

possibly indicating a greater approximation to the reproductive phase than in the untreated plants. Possibly the treatment was either faulty or unsuitable for the particular varieties used. The sorghum was treated for nine days at 30°C. in the dark. The treated plants germinated poorly but tillered vigorously and reached the same height as the controls; they seemed however to be later in maturity than the controls.

The potatoes were suspended, after removal of the sprouts, in a box fitted with a Philips projection lamp of 500W in an aperture in the lid, at a distance of 55 cm. from the tubers. The bottom of the box contained a mirror. By adjusting the position of the lamp in the aperture the temperature was maintained at 18–20°C. The tubers were treated for 26 days. The sprouts appeared above ground 10 days after planting, the untreated being a day earlier than the treated. The latter however grew more rapidly and vigorously and the foliage died sooner, on August 25th as against August 31st in the controls. The yield from 23 plants was 22·270 kg. in treated and 20·624 kg. in controls and the tubers were also larger.

614. LOWIG, E.

581.143.26.03

Jarowisationsversuche. (**Vernalization experiments.**)

Dtsch. landw. Pr. 1934 : 61 : 409–10.

The treatment of the seed followed closely the published method of von Öttingen. After treatment the vernalized seed was first re-dried and sown at a suitable time at Poppelsdorf and Dikopshof. Besides the main cereals, sugar beet was included in the experiments. The results are summarized as follows :—

- (1) An effect due to the pre-treatment of the seed was established with one exception in all the varieties investigated to a greater or lesser degree. The action was, however, very different according to the physiological nature of the variety.
- (2) Vernalization of the seed produced an advantage of practical importance in winter wheat, winter barley and sugar beets, i.e. groups whose development is interrupted by winter rest or the biennial habit.
- (3) Winter oats is always an exception and shews the same reaction as spring cereals. It is possible that it does not represent a definitely winter form but is only a more hardy variety of spring oats.
- (4) The result of the spring sowing of vernalized seed of Karsten V was a speeding up of development so that the wheat ripened in five months and with a yield equal to that of spring wheat; while from the untreated plots sown at the same time only a very few individual ears were produced and harvesting was out of the question.
- (5) Of the three varieties of sugar beet tested Dippe W 1 gave the best results and Westphal the least good. With an increase in the duration of vernalization all three varieties increased the number of shoots.

While the difference in the results of vernalization between 16 and 34 days treatment is negligible, an additional 10 days shew a marked result. A sufficient duration is thus a necessity for a satisfactory action of vernalization.

The practical utility of vernalization lies first in the possibility of the sowing of winter cereals in spring if a resowing is necessary because of winter injury. And winter sowing may be given up entirely if winter injury regularly occurs.

Also there is the possibility of hastening the vegetative period of spring wheat and of growing another crop after it.

615. MEDNIS, J. A.

581.143.26.03:633.14

(**Maturing winter and biennial plants in one summer.**)

Semenovodstvo (Seed Growing) 1934 : No. 5 : 30–31.

Ultra-early sowings were made of a number of crops, including winter rye, which was sown, unvernallized, on April 15th, 1933 at the Jaroslav station and left uncovered. The rye came into the shooting stage at the end of May and into ear only 15–18 days after autumn sown rye. It was harvested on 14th September and gave one centner grain and one centner straw per ha.

The possibility of obtaining a crop at all was due to the early sowing and germination of the grain uncovered on the surface of the soil. The average temperature for the first ten days of April was  $+2.8^{\circ}$ , for the second ten days  $+4.6^{\circ}$  and for the third  $+5.5^{\circ}\text{C.}$  and only three days were below  $0^{\circ}\text{C.}$ ,  $-2.90^{\circ}\text{C}$  being the lowest; the yields would have been still better therefore had the sowing been done at the beginning of April.

From these results it is seen that by suitable sowings at an early date natural vernalization can be effected.

No technique has yet been elaborated for vernalizing biennial crops such as turnips, swedes, cabbage, chicory, etc., but winter sowing often leads to bolting and seed formation in the first year. It is of interest to know what is the germinating capacity of this seed and what the value of the plants produced from it.

616.

JONES, D. F.

**The similarity between fasciations in plants and tumors in animals and their genetic basis.**

Science 1935: 81: 75-76.

581.143.32:575.113.7:576.312.36

633.15:576.312.36

The differences and resemblances between the forms of unregulated growth which result in the formation of fasciations or galls and tumours and the various effects of the action of lethal factors at different developmental stages in plants and animals or at critical sites in these organisms are discussed. An individual heterozygous for recessive lethals may remain completely normal but if the protective dominant allelomorphs are lost by non-disjunction, deficiency, deletion, etc., abnormal growth may ensue.

The effects of such lethals acting in restricted localities in somatic tissue may, as compared with their action in embryos, be entirely unrecognized.

The effects of somatic segregation due to "hemizygous" genes is exemplified by the variable patches of coloured aleurone in certain families of maize and it is suggested that the atypical growth observed in the same plant is the result of chromosomal unbalance following the loss of corresponding deficiencies in homologous chromosomes.

## FIELD EXPERIMENTS 631.421

617.

MICHEL, C. A. and SCHWENDERMANN, J.

631.421:631.557

**Determining yields on experimental plots by the square yard method.**

J. Amer. Soc. Agron. 1934: 26: 993-1001.

This investigation at University Farm, Moscow, Idaho extending over the period 1929-31 contrasts the actual and computed yields of varieties of winter and spring wheat, barley and oats. These varieties were replicated systematically at least three times on plots, one-fortieth of an acre in size. The computed yields were obtained from samples consisting of six square yards, taken at random from each plot after allowance had been made for discards. The actual yield was obtained by harvesting the remainder of the plot after this sampling had been done and adding the sample yield.

Computed and actual yields are compared firstly on a per acre basis and then as averages of 27 plots, from which appears the fact that in general the computed yield is higher than the actual yield. This difference, seldom significant, usually seemed highest when the season had been most subjected to extreme conditions, resulting in a very variable stand.

The correlations between actual and computed yields were in all cases positive and very significant.

A final comparison showed that with an increasing number of sampling units per plot the computed and actual yields tended to merge and in general 12 to 18 square yards should be taken per plot for the difference to be insignificant.

G. B. L.

618. FABRICIUS, J. C.  
**Attempt at a dissertation on the diseases of plants.**  
 Phytopath. Class. 1926 : No. 1 : Pp. 66.  
 FONTANA, F.  
**Observations on the rust of grain.**  
 Phytopath. Class. 1932 : No. 2 : Pp. 40.  
 MILLARDET, P. M. A.  
**The discovery of Bordeaux mixture.**  
 Phytopath. Class. 1933 : No. 3 : Pp. 25.

632

These publications represent the first three of a series to be issued by the American Phytopathological Society to comprise early papers of historical or fundamental importance to plant pathology.

The first is the attempt of a Danish naturalist in 1774 to classify and arrange his own observations and those of contemporary writers on the subject of plant diseases, under which is included not only those diseases now regarded as pathological but also various physiological conditions and sterility.

No. 2 gives the detailed observations of an Italian observer on *Puccinia* and the third is the translation of three papers by the French scientist Millardet. (1) Treatment of mildew rot, (2) Treatment of mildew with copper sulphate and lime mixture and (3) Concerning the history of the treatment of mildew with copper sulphate.

619. MEHRLICH, F. P. 632.411.4:576.16:578.081  
**Physiologic specialization in *Phytophthora* species.**  
 Phytopathology 1934 : 24 : 1148-49.

Tests to produce pineapple heart rot with various species of *Phytophthora* from a number of different economic host plants yielded evidence of physiological specialization. These findings are also interpreted as throwing doubt on the validity of distinguishing species by their pathogenicity.

620. MÜLLER, K. O. 632.411.4:576.16:633.491  
 Über den augenblicklichen Stand unserer Kenntnisse zur biologischen Spezialisierung des Krautfäuleerregers der Kartoffel (*Phytophthora infestans*.) [Our present position with regard to the knowledge of the biological specialization of the pathogen of potato blight (*P. infestans*.)].  
 Züchter 1935 : 7 : 5-12.

In this lecture the main facts relating to the discovery of biological races of *Phytophthora* are briefly stated, the question whether the new S strain differs genotypically from the original A strain or is only a permanent modification is discussed and the conclusion reached that there is a definite genotypical difference between them.

The behaviour of the strains on the cultivated potato varieties of Central Europe, on the Ef and W races and on *S. demissum* and its hybrids with cultivated varieties is described, from which it appears that at least three different groups of biotypes are concerned. The distribution of the S strain throughout Germany is surveyed.

There is no doubt that the S strain has arisen by mutation from the A strain and it is possible that resistant potato varieties may be obtained by species crosses between *S. demissum* and *S. tuberosum* but still more data on the biological specialization of the pathogen of potato blight are desired.

621. PERRIER, A. 632.422.3:575.42:663.2  
 Os levedos seleccionados na vinificação. (Selected yeasts in wine making.)  
 Rev. Agric. S. Paulo 1934 : 9 : 112-20.

Different races of yeast give different properties to the wine and unless great care is taken there will always be certain races present whose effect is prejudicial to the quality of the wine. By using pure, selected strains of yeast not only can these prejudicial effects be obviated but the quality can be very much improved, especially in respect of subtleties such as "bouquet."

622.

MELCHERS, L. E.

632.451.3:576.16:633.11  
633.11-2.451.3-1.521.6:575**Investigations on physiologic specialization of *Tilletia laevis* in Kansas.**  
Phytopathology 1934 : 24 : 1203-26.

Collections of bunt were made from a number of different parts of the State to determine the number of physiological forms present, as a preliminary to the production of desirable bunt-resistant hard winter wheats.

Twelve varieties of wheat were used of which six were finally selected as differentials for physiological forms. Distinct differences in reaction to the various bunt collections were noted in a number of varieties. Kanred, on the other hand, was highly susceptible to every collection. A dichotomous key is given for the identification of the seven physiological forms which occurred in the collection tested in 1929-32.

Experiments on the re-inoculation of varieties of wheat with their own bunt indicated that in 10 cases out of 32 there was an increased infection as compared with that of the preceding year. Marked increases in infection are due, it is suggested, to the production of new forms by segregation after hybridization.

The hybrid Turkey x Bearded and Yogo were resistant to all the collections tested. Other varieties such as Martin, Ridit, Hussar, White Odessa, Banner Berkeley, Regal, Oro and Koopertorka were highly resistant but are known to be susceptible to forms in other parts of the U.S.A. The importance is stressed of a thorough testing of new selections and hybrids for resistance to the number of physiological forms likely to be encountered and under all possible environmental conditions.

There would seem to be nothing to prevent the production of desirable resistant varieties and already promising selections from the cross Oro x Tenmarq have been obtained.

623.

NIEVES, R.

632.451.3:576.16:633.11

Infección experimental del centeno de Petkus por las caries del trigo (*Tilletia tritici* y *Tilletia levis*). [Experimental infection of Petkus rye with wheat smut *T. tritici* and *T. levis*.]

Rev. Argent. Agron. B. Aires 1934 : 1 : 97-110.

Further proof of physiological specialization in *Tilletia tritici* and *T. levis* is given. Certain races of *T. tritici* will attack rye, normally immune, and all four forms of *T. levis* established attack rye. The results favour the view that *T. secalis* is a physiological form of *T. tritici*.

624.

HANSEN, H. N. and SMITH, R. E.

632.48:575.242

**Interspecific anastomosis and the origin of new types in imperfect fungi.**  
Phytopathology 1934 : 24 : 1144-45.

It is suggested that certain aberrant forms arising in combined interspecific cultures of *Botrytis allii* and *B. ricini* and producing types that might be regarded as new varieties or even species may be due to genic changes induced as a result of specifically different nuclei being brought together in the same cell as a result of anastomosis.

## ECONOMIC PLANTS 633

625.

HERNANDEZ, B.

633(91.4)(016)

633:575(016)

**Philippine bibliography of the nine major crops of the Philippines : rice, sugar cane, abaca, coconut, tobacco, corn, maguey, coffee and cacao.**

Bur. Sci. Lib. Manila 1933 : Pp. 132.

This bibliography gives information on some of the investigations made during the past 15 years. Under the individual crops references will be found to cultivation, variety trials, yields, selection, breeding, pests, diseases, economic questions and other subjects—all represented in varying proportions according to the particular crop in question.

The section on each crop has a subject index ; and a general bibliography and list of journals consulted is appended.

626.

FRANDSEN, H. N.

Forædlingsarbejdets Opgaver og Betydning. (**The problems and importance of plant breeding.**)

Tidsskr. Frøavl 1934 : 23 : 130-45.

633:575

633.41:575(48.9)

633.426:575(48.9)

A simple account of genetic progress in various countries as seen in the improvement of various cereals and root crops precedes descriptions of the results attained in Denmark with barley and root crops (e.g. the development of the Barres strain of mangels), in all of which yield and quality have been raised. Tests of a new yellow forage sugar beet seem to shew that a relatively smooth and suitably shaped beet with a dry matter content of about 16-18 per cent has been evolved. Similar lines of work in breeding disease and pest resistant lines of swedes appear to be leading towards more resistant and higher yielding types such as the new Bangholm strain from a Wilhelmsburger x Bangholm cross.

627.

HIORTH, G.

Moderne prinsipper i planteforedlingen. (**Modern principles in plant breeding.**)

Tidsskr. Norske Landbr. 1934 : 41 : 183-97.

633:575

A general review of modern methods and progress in plant breeding.

628.

KONSTANTINOV, P. N.

(**On agronomical measures in breeding.**)

Semenovodstvo (Seed Growing) 1934 : No. 2 : 46-48.

633:575

633:575.127

The author regrets that newly bred varieties are so often produced without full indications being given of their agronomic characteristics and capabilities. By means of the fullest possible agronomic testing of the breeding material under the widest possible range of conditions much time can be ultimately saved in breeding work, since the reaction of the varieties is quite different under different conditions. Testing under irrigated as well as dry conditions is particularly important, both in respect of the initial material and the early selections. Similarly all strains should be tested on both manured and unmanured plots, in normal and ultra-early sowings ; the reaction to vernalization should also be considered. All other agronomic measures should as nearly as possible coincide with the agronomic practices of the districts which the breeding work is designed to serve. In this way the production of the best adapted varieties is assured with the least loss of time.

629.

VAVILOV, N. I.

(**Main problems of Soviet plant breeding and methods of solving them.**)

Semenovodstvo (Seed Growing) 1934 : No. 2 : 5-20.

633:575

633:575.127

In outlining the aims of plant breeding in the Soviet Union the necessity for an adequate system of seed production for the breeders' new varieties is emphasized. The author deprecates the lack of attention to the inheritance of quantitative, physiological and other economically important characters, even in such plants as maize and wheat whose genetics has been most widely studied, and expresses the need for a sound theory on which to base the breeding work of the future. The idea that breeding need have little or no relation to genetical theory and can be carried on independently of it is particularly deprecated. All breeding work should be accompanied by a genetical analysis, based on a thorough knowledge of the constitution of the parental material, which should therefore be genetically pure. Even when the growing of mixed populations up to the fifth or sixth generation, whereupon selection is begun, is permissible, as in interspecific hybridization, yet part at least of the  $F_2$  and  $F_3$  generations should be subjected to genetic analysis. An examination of a great number of institutions has convinced the author that it is not the scale of work or the equipment so much as its genetical foundation that leads to success. The main points to which attention must be given in breeding are discussed in turn. Firstly the question of the initial material. The local material, adapted to local conditions, should be made use of as much as possible and should form the basis of all breeding work. Recourse should also

be had to the world collection of the plant in question. Among the enormous number of new species and forms of the common cultivated plants collected by the Institute of Plant Industry some have been found suitable for immediate introduction but very many more are valuable for selection or hybridization on account of the possession of some particular character or group of characters.

Under the influence of vernalization varieties may be transformed from types quite unsuitable as regards a given region into high yielding forms of high quality. Henceforth vernalization should always be applied, both to the initial material and to the selections. An entire revision of the world collection on the basis of their reaction to vernalization is at present being effected. Vernalization may alter not only the vegetative period of a variety but also qualities such as lint length, vitreousness of grain and others. It can be applied with advantage to the choice of parental forms and to the speeding up of breeding work.

With regard to the choice of parental forms, the pedigrees of the best varieties shew that these have most often originated from crosses of different geographical races. The parents have however been chosen, if not at random, at least without any reliable system and Soviet breeders are recommended to carry out a series of cyclic crossings with the object of determining the most favourable parents and parental combinations. Lyssenko's theories of the successive stages of development may also have an important bearing on the question. It seems evident that definite factor complexes in certain geographical races have a tendency to be inherited together and this may be a great practical advantage in breeding.

The method of distant hybridization has a great future especially in plants capable of vegetative reproduction, as illustrated by the success of I. V. Michurin with the fruit trees. The method when applied to seed plants requires above all an extremely large scale of work. The mass natural hybridization of wheat and rye carried out at Saratov in 1917 would require a whole army of breeders if it had to be performed artificially and such a piece of work is unparalleled in any other part of the world; and still the segregation is so complicated that to-day after seventeen years, the goal has not yet been reached and the desired forms have not yet been obtained in a pure state. Similar work has been in progress for the last ten years in Argentina, where not the wheat-like segregates, as at Saratov, but the intermediate segregates have been selected. Various productive intermediate lines have been isolated but neither in grain quality nor in yield do they equal the common wheats and considerable further work on the lines of back-crossing will be necessary to make them worth anything agronomically. The various hybrids and amphidiploids of wheat x *Aegilops* are also of great interest theoretically but as yet of little practical value. However the possibilities on these lines are far from exhausted and the rye-wheat and wheat-couch hybrids in particular are thought to be promising; also the cross between hard and soft wheats, which has already produced the successful hybrid Sarrubra at Saratov, though even this work is far from easy and must be carried out extensively and scientifically for any hope of success.

One of the most successful fields of interspecific crossing is the genus *Nicotiana* but none even of these interspecific hybrids has yet been used in cultivation. The crosses between Egyptian and American cotton, when examined critically by the author, convinced him that this work has still a long way to go and there is as yet no firm proof that it will yield practical results, though the possibility remains. The *Triticum-Agropyrum* hybrids may have a great future if they can be vegetatively propagated. A final assessment of their value must await their further investigation.

The experience so far obtained in interspecific hybridization shews that one of the essentials is to cross nearly allied species. Thus the discovery of the new species of 28 chromosome wheat, *T. persicum*, *T. Timopheevi* and the various new Abyssinian species, possessed of a number of new or valuable characters, has opened up new possibilities in the breeding of the hard wheats. The use of the new species of 42 chromosome wheats *T. sphaerococcum*, *T. macha* and *T. Vavilovi*, the Mediterranean oat *Avena byzantina* and the cotton species *Gossypium purpurascens* creates similar possibilities in these crops. The greatest possible attention in working on these crosses must be given to the choice of the most suitable parental combinations and when necessary the method of back-crossing must be used. The work must be combined with the necessary genetical and cytological studies and its scale should be confined to the capabilities of the trained scientific staff available.

The most difficult branch of breeding to-day is the work with cross-fertilized plants. A study of the biology of flowering and pollination on an extensive ecological range of material must serve as the basis of all work; most cross-pollinated plants show a gradation from complete self-sterility to partial or complete self-sterility or from complete dioecism to hermaphroditism. There are often regular geographical differences in these respects. Experience has shown that it is not necessary to attain absolute homozygosity, partial inbreeding is usually successful. Even with partially cross-pollinating plants like cotton a careful isolation in the early stages of breeding is more important than is commonly realized. The choice of initial material is of equal importance in cross-pollinated plants, as shown by recent experiments in the Soviet Union, e.g. forms with high sugar content have been produced by crossing the garden mangold with the forage beet. Inbreeding can also be used for the discovery of new desirable characters, a method now being applied with success in sugar beet and rye.

The artificial production of mutations by X-rays and other agents has so far yielded very few if any superior forms, with the exception of improved forms of tobacco produced in Java and the cold-resistant mutant described by A. A. Sapehin. The vast majority of cases are chlorophyll, chromosome or recessive gene mutations of a definitely inferior and undesirable nature. Neither these nor the methods of "electrogenetics" of Pirovano, whose results await confirmation, can be recommended as a means of obtaining practical results.

Great stress is laid on the breeder's need of cooperation with the allied sciences of plant physiology, biology, technology, phytopathology and entomology. Breeding for quality, for chemical composition, is especially essential. Crossing the cultivated melon with a wild melon at the Institute of Plant Industry has doubled the sugar content, although the wild melon used was not sweet. Different varieties of fruits have proved to be very different in vitamin content. The study of aromatic plants is disclosing laws by which it is possible to predict those forms and species likely to contain any particular compound. Tobacco and lupins free from alkaloid have been found and Baur before his death found certain lupins almost equal to soya bean in protein (32 per cent) and fat (18 per cent) content.

Chemical analysis will assist in the breeding of varieties resistant to drought and cold and the growing use of fertilizers now makes it necessary to breed races capable of responding to this treatment, a character in respect of which marked varietal differences have been observed. The estimation of quality on small samples, the study of the racial composition of the main fungous pests and the growing of breeding material during the winter or dry seasons are all matters that call for further investigation.

630. KÜHLE, L. 633:575(43)  
 Neue Nahrungsmittel werden gezüchtet. (**New food materials are being bred.**)  
 Umschau 1934 : 38 : 1018-21.

An outline is given of the main lines of investigation and achievements of the Kaiser Wilhelm Institut für Züchtungsforschung. These consist in the breeding of high quality wheats by crossing German with American varieties; the selection and release to the market this year of alkaloid-free lupins, capable of growing on the most unfavourable light soils and yielding remarkable quantities of green fodder; and the production of mildew-resistant vines which are now being tested for resistance to phylloxera and for quality.

Cold resistance in potatoes is a very desirable feature for early planting and potatoes from the mountains of Bolivia are being crossed with German varieties. The Bolivian forms could only be grown by covering them over at 6 p.m. every day to cut down the length of day. The keeping quality of the tomato has also been improved.

631. FRENKEL, A. JA. 633:575(47)  
 63.00.15(47)  
 (**Breeding problems in the central and western parts of the non-chernozem region of the U.S.S.R.**)  
 Semenovodstvo (Seed Growing) 1934 : No. 1 : 31-33.

A brief account of the five research stations included in the system of the Moscow Breeding Centre and the crops and problems with which each is concerned and the regions served by the respective stations.

Emphasis is laid on the need for improved and modernized methods of breeding, the provision of the necessary apparatus for vernalization and for improving the methods of cultivation of the breeding materials, also on the need for more genetical study and a linking up of genetics with cytology and other allied subjects. A strong recommendation is made that the introduction and testing of local and foreign material should be carried on parallel with the production of new types by hybridization and that neither of these methods should be practised to the exclusion of the other. A thorough examination has been made of the ancient local wheats and these will form the foundation for breeding operations. Similar investigations are to be made on the other crops. Intervarietal and interspecific hybridization and the production of artificial mutations are also being undertaken.

Improved varieties of one or two crops have been produced by the Breeding Centre. Reference is made to a number of defects in the Centre's activities.

632. SAULESCU, N. 633:575(49.8)  
Die Station für Pflanzenzüchtung und Samenkontrolle Cluj (Rumänien).  
[The Cluj (Rumania) station for plant breeding and seed control.]  
Züchter 1935 : 7 : 19-23.

A description of the aims and organization of this experiment station.

633. 633:575:551.566.3

# **Problems of Northern Agriculture.**

Lenin Acad. Agric. Sci., Inst. Pl. Ind., Leningrad 1934 : No. 4 : Pp. 195.

A further collective work by various authors on the important problems of extending cultivation towards the north. Various aspects are dealt with and the following articles will be of interest to breeders :—

- \*V. RAZUMOV and M. I. SMIRNOVA. *Vernalization of agricultural plants in the extreme north.* (pp. 47—59.)

The continuous natural sunlight of the arctic summer is peculiarly favourable to experiments involving the second of Lyssenko's developmental stages, the "photo-stage." The world collection of barleys was vernalized in the ordinary way, the winter varieties at + 2°C. for 30-35 days, the spring varieties at + 6° to + 8°C. for 15 days. When vernalized all varieties came into ear whereas only 665 of the 1,505 varieties eared in the control sowing and their earing was much more irregular or delayed. The number of varieties which matured was in each case much less than the number which came into ear but in the vernalized lot 42 per cent gave ripe grain, as opposed to 15 per cent in the controls. The number of varieties it is possible to grow has thus been trebled.

The varieties from different countries behaved differently, those distinguished by the best agronomic qualities after vernalization were those from the North Caucasus, which though not quite so early as the Italian and Asia Minor forms, yet ripened and gave a yield as high as the standard spring barleys. These results entirely change the present ideas on the relative merit of the varieties and it is probable that by the application of the method of choosing complementary parental pairs proposed by Lyssenko it will be possible to build up successful new varieties that do not require vernalization.

These conclusions probably apply also to other crops. Each variety has its own requirements of temperature, moisture, etc. The knowledge of the principle of vernalization makes it possible to select forms which react favourably both in the first (temperature) and second (light) stages of development and will grow in a given district without the need for vernalization. Success in this direction largely depends on the temperature conditions of the region. For instance Spanish and Italian barleys come into ear in the extreme north without vernalization but most of them fail to mature grain, owing to the late date of the ear emergence. Thus although the plant completes the first stage it does so too slowly for practical purposes.

The second developmental stage is that which requires light, and here again the varieties differ in their precise requirements, mainly in their different degree of sensitivity to length of day. Varieties from the south pass through the second stage most rapidly in a 24 hour day but a

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\*A full summary of this paper is on file at the Bureau.

reduction of this to 18 or even 15 causes very little retardation. Northern varieties however are extremely sensitive to length of day in the second stage and even an inconsiderable reduction in the daily illumination brings about a marked retardation. Thus northern varieties are greatly accelerated when grown in the arctic circle but southern ones are affected much less.

Experiments are described in which Pioneer barley was vernalized and grown under various conditions to test the effect of these on the second developmental stage. It was shown that even under continuous light low temperature retarded the development. Thus light, though the most important factor for the second stage, is not the only one and cannot be considered without relation to temperature. The low night temperatures in the arctic circle may therefore have a retarding effect on the second stage in spite of the continuous illumination. Every variety has its own temperature requirements also for the second stage.

At all lengths of day the plants produce more vegetative matter at the low than at the high temperatures.

Spinach runs to seed very badly in the extreme north and no strain free from this defect has yet been found. Both spinach and beet are long-day plants but behave differently, e.g. in continuous light spinach runs to seed most rapidly at high temperatures, beet at low. In continuous light spinach runs to seed most rapidly at high temperatures, beet at low. In a 15 hour day spinach runs to seed at high temperatures but not at low temperature in the open. The differences between the two plants lie in their requirements in the first stage, beet requiring a low temperature, so that in the hothouse it fails to effect the first stage and even continuous light does not cause bolting. This again illustrates the principle of vernalization, that without the completion of one phase the succeeding phase cannot be effected. When grown in the open the temperature at night is sufficient to effect the first stage and the continuous light favours the second, leading to rapid bolting. In a 15 hour day the second stage is held up and so even at low temperatures the plant again does not bolt. Spinach on the other hand requires a high temperature in the first stage. Thus to avoid bolting, beet must be sown at a fairly high temperature and spinach at a low temperature with reduced length of day.

Experiments were also done on the potato, which shew that the combination of low temperature and long day is not detrimental to tuber formation but definitely the reverse. This again proves that conclusions as to photoperiodic reaction drawn without reference to the previous conditions of the medium may be misleading and often false; the short-day reaction of tuber formation in the potato holds only at certain conditions of temperature and at low temperatures it is quite reversed to a long-day reaction. Many early varieties of potatoes however give a greater yield of tubers in continuous light at a higher temperature than at a low one, and low temperature applied uninterruptedly even for a short period is definitely prejudicial.

\*I. A. VESSELOVSKII. *New stages of the work of potato breeding in the extreme north.* (pp. 73—80.)

Of the new South American potato species brought over by Bukasov the ones of greatest interest are *Solanum acaule* Bitt. on account of its frost resistance, withstanding as it does — 10°C.; *S. Rybinii* Juz. et Buk. for its extreme earliness and freedom from dormancy of the tubers; *S. pureja* Juz. et Buk. for its earliness and good tuber production; and *S. Antipovichii* Buk. et Juz. and a number of other forms from the Andes for their resistance to *Phytophthora infestans*. Mass hybridization has been carried out since 1928 with these and other Andean species. When tested at Hibiny in the arctic circle the seedlings withstood temperatures of — 2.3°C. in bog soils and — 3.2 in ordinary soils and exceeded standard varieties like Early Rose in yield and many also in starch content. Some of the earlier hybrids between standard varieties also excelled the standards; the successful combinations are enumerated.

A still further degree of frost resistance is desired, if possible resistance to as much as — 6°C., and for this purpose crosses are now being made with a number of the wild species which in northern latitudes form no tubers at all, e.g. *S. acaule* has been crossed with *S. aracc papa*, *S. Rybinii*, *S. goniocalyx* and *pacus*. Most of these hybrids however give little or no tuber formation, but this year successful crosses have been made of the hybrid *S. acaule* x *S. goniocalyx* with *S. tuberosum* varieties Alma, Centifolia and "Rawling Kidney," and of *S. pureja* x

\* A full summary of this paper is on file at the Bureau.

*S. acaule*, the latter giving very good seed. The hybrid *S. acaule* x *S. goniocalyx* continued to flower at a temperature of  $-5-7^{\circ}\text{C}$ . Some of the new seedlings are very early and transmit this quality to their progeny. As a result of the ease with which seeds can be obtained at Hibiny the genetic constitution of the forms is being studied by self-pollination. *S. tuberosum* is now regarded as a subspecies of the large species *S. andigenum* and is much inferior to this species in the number of characters it possesses. Its main feature is the large size of its tubers, a character that is transmitted to its progeny and can be combined with the high yielding capacity of *S. andigenum*. The examination of a large number of crosses leads the author to conclude that the characters of the maternal parent tend to be expressed in the progeny more than those of the pollen parent.

Under the conditions of the arctic circle many of the species flower and set seed earlier and more successfully than further south and Hibiny appears for this reason to be very favourably situated both for maintaining the world potato collection and for making hybridizations.

M. A. ROSANOVA. *The small fruit resources of the north.* (pp. 107—16.)

Many of the forms found in the extreme north of the U.S.S.R. are of unusual interest for northern agriculture on account of their cold resistance. *Rubus chamaemorus* is the most resistant and is found as far north as Novaya Zemlya. It is closely followed by *Vaccinium vitis idaea*, *V. uliginosum*, then *V. myrtillus*, *Oxycoccus microcarpus* and *Rubus arcticus*. All these species are to be found growing within the arctic circle. Raspberries and red and black currants grow almost up to the arctic circle and these northern forms have the advantage of being both hardier and earlier than the common cultivated varieties. All these northern fruits deserve attention as material both for direct introduction and for selection and hybridization. In hybridization, use should be made also of the large-fruited American forms most closely allied and having the same chromosome number.

Various southern fruits which are promising for cultivation in the extreme north are also indicated, together with a number of wild species which should be considered in selecting forms for hybridization, e.g. the cold-resistant wild species of strawberry *Fragaria virginiana*, *F. chiloensis*, *F. platypetala*, all having 56 somatic chromosomes and thus more successful in crossing than the Russian wild strawberries.

The high vitamin content, especially of Vitamin C, is another valuable feature of the northern fruit forms and a matter to be kept under consideration in breeding.

N. V. KOVALEV. *The mountain ash as a northern fruit tree.* (pp. 117—30.)

The mountain ash, though it has been cultivated for fruit since Grecian times, has never been used to the extent of its deserts; only two species *Sorbus domestica* and *S. aucuparia* are so used. The fruits can be put to a great variety of uses, in the fresh and dried condition and as flour. The sugar content in some forms of *S. domestica* is as high as 13.7 per cent. There already exists in nature a considerable diversity of species and hybrids between them: the forms available display a wide range of variation in characters such as soil requirements, form of tree and of fruit, colour and size of fruit, content of acid, pectin and sugar in flavour, frost resistance, drought resistance, etc., etc. and the plant is thus a very favourable object for breeding.

Many so-called species are almost unquestionably hybrids between *Sorbus* and *Pyrus*, e.g. *Sorbo-pyrus auricularis* and *Pyrus Polwera*, and many hybrids between *Sorbus* and *Aromia* also exist. Nearly all the widely scattered species can be intercrossed and natural hybridization is common. Substantial improvements are anticipated from interspecific crossing and crossing with the allied genera *Crataegus*, *Amelanchier* and especially *Pyrus*. Already 25 species and 36 forms of the mountain ash have been collected and the work of breeding has begun.

An outline is given of the systematics of the species within the genus and of the main characteristics of the species and a number of the existing hybrids. An enumeration of the main hybrids, with indications of their symbols, is given. The most interest for the north is attached to the species of the group *Aucuparia*, especially *S. aucuparia* var. *rossica* x var. *moravica*, one of the forms with the best quality of flavour in the fruits, which can be eaten raw. The tolerance and high yield of this group also recommend it. For more southern districts *S. domestica* with its

extraordinarily high yields of fruit is recommended, especially if the fruit could be made less bitter, softer and more juicy. Great hope in this respect centres in the cross of *S. domestica* with *S. Aucuparia*. *S. Aria* and its hybrids (*S. Hortii* etc.) are of interest for the size and flavour of their fruits and the author is confident that a further search will reveal still more promising varieties of *S. Aucuparia* itself.

634. KOČNAR, K. 633:575:578.08  
 Listkové protokoly v šlechtitelské praxi. (**Loose-leaf records in the work of the plant breeder**).  
 Věstn. Čsl. Akad. Zeměd. 1934 : 10 : 588-90.

A method of recording laboratory data in serial experiments in plant breeding is recommended for speed and convenience in the classification of material and allotting points and in the selection of outstanding plants and populations for multiplication and further experimentation. The statistical estimation of the uniformity of the experimental material, correlations and the inheritance of characters are also facilitated.

635. SAPEHIN, A. A. 633:575:578.08  
 (**Measures for accelerating breeding of agricultural plants**).  
 Semenovodstvo (Seed Growing) 1934 : No. 3 : 3-5.

By the proper use of the greenhouse it is possible to grow the  $P_1$  and  $F_1$  of a cross in the autumn and winter and the  $F_2$  and  $F_3$  in the spring and summer and so save one to two or even three years. Suitable regulation of the temperature and light enables vigorous tillering to be induced in the  $F_1$  and  $F_2$ , leading to a large population in  $F_3$ .

When several varieties have to be crossed to attain the desired combination of characters it is recommended that this should be done by crossing the  $F_3$  *inter se*, rather than selecting desirable forms from the first cross, crossing with a third form, selecting desirable forms and again crossing with the fourth form etc., etc., as is the common practice among breeders. In the case of a high quality variety that requires improving in certain respects only, the method recommended is to cross it with a form possessing the desired character or characters and back-cross repeatedly to the high-quality parent, discarding all the segregates but those possessed of the new character to be introduced. This method involves a large number of generations and is only feasible when a number of generations can be grown per year.

In making efficient selections it is necessary that all the diseases, pests and unfavourable influences to which the plant will be liable to exposure should be applied in an exaggerated degree, if necessary artificially. Furthermore, the methods of estimating quality of industrial products must be refined so as to be applicable to small quantities in the early stage of breeding. A greater variety of methods is also necessary in testing the quality since a variety may give quite different results with one race of yeasts or one type of water, etc., etc., from those given with another. The multiplication of a new variety can be greatly speeded up by vegetative means, cuttings etc., and by judicious application of vernalization the vegetative phase can be extended to give a greatly increased tillering and yield of seed.

The final stages of selection should be carried out at points representing all the types of microclimate that the breeding work has to serve. All the promising new varieties must be multiplied up at first, until the final decision is made as to which is the best. The loss of space incurred by this means will be more than compensated by the gain in time. Every possible cultural measure must be employed to obtain heavy yields per plant and so expedite the multiplication.

636. IVČENKO, L. A. and VACENKO, A. A. 633:575:578.082:581.143.26.03  
 (**The production of two crops in one year without hothouses**).  
 Semenovodstvo (Seed Growing) 1934 : No. 1 : 22-24.

Experiments were made in 1933 with seed of the cross *Triticum durum* var. *Reichenbachi* 0843 x *T. durum* var. *melanopus* 037 and the seed of the variety Černouski 069, harvested at the middle of the wax-ripe stage. Seed gathered at this stage germinates immediately without a period of rest. On the 4th August, after drying in the ear, they were germinated in the laboratory and on the second day placed in the ice chest for vernalization. The vernalized seed was sown in boxes on the 16th August and came up on the 19th. One lot was treated with supplementary illumination

by one 500 W. lamp per square metre during the night from 23rd August for 18 days. The other half was grown outside in natural illumination. On 23rd September the plants receiving additional light were in ear and the untreated were still in the tillering stage. Flowering began on 30th September and the plants were taken into the laboratory where the temperature of 20°C. necessary for anthesis was maintained. Flowering was completed in 7-10 days and fully mature grains were obtained on 5th December, whereas the non-illuminated plants had still not eared. The weather conditions were not as favourable as in average years and the first sowing was at least ten days later than usual, therefore the success in normal years should be still more pronounced.

Similar experiments were done with barley, chilling it for seven days. Grain was obtained at the end of September, in this case without the necessity of artificial illumination.

In view of the simplicity and cheapness of the method it is proposed to use it extensively at the Artemov Station where the experiments were performed.

637. KRASNJUK, A. A.

633:575:581.143.26.03

**(Once more on accelerated methods of breeding.)**

Semenovodstvo (Seed Growing) 1934 : No. 5 : 16-17.

Ten ears were gathered each day from five varieties of cereals, two winter and three spring, starting on the sixth day after flowering. In each case half the grain was sown at once and the other half was dried for five days and then sown. The winter varieties were vernalized in the ordinary way, the spring varieties were sown without treatment. In the early pickings the germination was low but varied markedly between varieties. In the early pickings the green seed germinated better than the dried seed, the latter being slightly superior in the later ones.

The results show that the best germination is obtained from seeds picked at the beginning of the wax-ripe stage, which in itself makes it possible to reduce the vegetative period by ten days. The vernalization of the winter cereals moreover greatly accelerated germination, so that, for instance Eliseevskaja rye gave 93 per cent germination and *lutescens* 329 gave 96 per cent sixteen days after flowering. It is therefore probable that similar acceleration in germination could be obtained by vernalizing spring varieties. Winter varieties are commonly harvested 38 days after flowering, so that by obtaining normal germination on the sixteenth day a gain of 22 days is made, which added to the ten days saving on the after-harvest ripening makes a total gain of about one month. This makes it perfectly possible to get two generations a year in the greenhouse.

Observations on the grain weight shewed that normal weights of 9-12g. were obtained by ten days after flowering. In development only the plants from the very early pickings were at all inferior.

638. \*LYSENKO, T. D.

633:575:581.143.26.03

**(The physiology of plant development in breeding work.)**

Semenovodstvo (Seed Growing) 1934 : No. 2 : 20-31.

This is Lysenko's most recent presentation of his theory, the substance of which is that the development of a plant organism consists of several stages, through each of which the plant passes as a result of the inter-action with the external medium. Different stages of development of one and the same plant require different external conditions. Two stages are at present distinguished, the so-called "vernalization stage," which is regulated mainly by temperature, and the so-called "photo-stage," regulated mainly by light. The second stage can take place only after the completion of the first stage. The problem of the breeder is by suitable crossing to produce a genotype such that its individual development will give a form suitable for the conditions of the region for which it was designed.

On the basis of the present knowledge of the first two stages of development of the plant as a whole in such plants as wheat, oats, barley, maize, soya bean, cotton, hemp, etc., it is possible to choose suitable parental pairs, such that their progeny will possess the precise vegetative period required by the breeder. Several pairs of late wheats, oats and barleys at Odessa can be indicated which on crossing will unfailingly produce ultra-early forms, and other pairs of medium-early varieties which on crossing will give late segregates. This has been made possible only by

\* A full summary of this paper is on file at the Bureau.

the study of the general development of the plant. By the use of the world collection of wheats on these lines it ought to be possible to create forms of any desired vegetative period in any particular region.

The production of early forms by crossing two late varieties is achieved as follows: one variety may be late in a given region because it takes too long to pass the stage of vernalization, all other stages being capable of passing quite rapidly in the district in question, including the "photo-stage"—such a variety will be late only because of the delay in the vernalization stage. Another variety is delayed in the "photo-stage," all other stages of its development, including the vernalization stage, passing rapidly—this variety will nevertheless also be late. Varieties of these two types were crossed in 1933 and the  $F_4$  generation is now growing. Segregates have already been obtained that are earlier than both parents in nearly all the thirty combinations of this type that were made. There were a few exceptions, probably owing to the existence of other stages influencing the vegetative period besides these two.

By this method it ought to be possible to produce varieties of such plants as runner beans, soya beans and maize, capable of ripening in northern latitudes. Similarly with cotton, there are many varieties that are late for a number of different reasons and by crossing them it should be possible to produce types earlier than the parent and even than the varieties commonly grown in the district in question.

639.

NILOV, V. I.

633:575:581.192

633.81:575.127.2

**(The chemical variability of plants and the significance in systematics and breeding.)**

Bull. Appl. Bot. Leningrad 1934: Ser. A(11): 21-40.

There can be no doubt that the differences between species or between forms are ultimately traceable to the stereochemical grouping of the molecules of the proteins and other bodies of which the plant is composed. The investigations have shewn that there is a gradual change in the content of such materials as essential oils during the ontogeny of the plant, the different phases of development being characterized both by different quantities of a given compound and also by the presence actually of different compounds. External influences, of which various types are indicated, can affect only the amount and proportions but not the type of compounds present. Variations within the species is again of the same kind, quantitative rather than qualitative. Thus the essential oil content of *Lavandula vera* varies from 0.6 to 11 per cent in different forms examined and the content of the complex linalool esters varies from 10 to 73 per cent but the compounds present are always the same, though their proportions may differ considerably. Similar cases of variation in proportions were observed in various other aromatic plants grown under identical conditions, the actual composition of the compounds remaining the same. Certain cases are mentioned however where occasional forms within a species contain a compound different from those occurring in the rest of the species, e.g. certain forms of *Foeniculum officinale*, forms of *Ocimum cana* externally identical with the rest but containing camphor, in place of the methyl ester of cinnamic acid and a number of others. In many cases such forms may be interspecific hybrids but if not, then the author claims that they should be given the rank of distinct species. Reference is made to a hybrid obtained by P. A. Nesterenko between *Ocimum canum*, which contains camphor, and *O. gratissimum* containing eugenol. The hybrid, though morphologically resembling *O. canum*, contained solely eugenol without a trace of camphor. It therefore seems probable that some of the aberrant forms above referred to may also be interspecific hybrids.

In considering the relationships between different organic compounds the author considers that isomeric differences are of more weight than mere differences in composition. The greater the difference in systematic position, the greater the difference in the nature of the compounds produced by a plant are expected to be. Even individuals within the species may exhibit certain differences but these are too slight to be detected at present and are therefore unimportant. Within most aromatic genera there occur different species, some synthesizing aliphatic compounds, others bicyclic, others monocyclic and others aromatic. It would appear therefore that it should be possible to find in any genus some species which produces any required type of compound.

This moreover means that the same compound or type of compound occurs in widely unrelated species belonging to quite different genera and even families. Thus similarity of compounds can be taken only in conjunction with other systematic characters as a sign of relationship.

By hybridizing forms which synthesize the same compound but in different proportions it is possible that segregates transgressing the parental proportions may appear. This is more or less the limit of the possibilities of intra-specific crossing. By crossing species synthesizing different compounds however it is likely not only that forms containing both compounds in varying proportions will segregate but that others containing various new compounds not present in the parental species will appear. Such a case has been observed in a hybrid between *Pelargonium radula* and *P. capitatum*, the oil of which contains 95 per cent of an organic acid not known in either of the parental species. Similar effects may occur through mutation, as in a bud mutation of *Pelargonium roseum*, the oil of which is in several features distinguishable from that of the parent form.

Thus by studying the intraspecific variation it is possible to select forms with increased percentage and quality of a given principle, whilst hybridization between species and possibly also artificial mutation point the way to the production of new principles altogether or to the introduction of a principle from one species to another in which it has not hitherto been found.

640. SENGBUSCH, [R.] von 633:575:581.192(43)  
Erfolge auf dem Gebiete der Züchtung landwirtschaftlicher Nutzpflanzen.  
(Results in the field of breeding agricultural crop plants.)  
Umschau 1934 : 38 : 813-14.

SENGBUSCH, R. von  
Über Erfolge auf dem Gebiete der Züchtung landwirtschaftlicher Nutzpflanzen  
(Results in the field of breeding agricultural crop plants.)  
Wiss. Woche zu Frankfurt a.M. 2.-9. September 1934 : Bd. 1 : Erbbiologie.  
118-27.

Germany, especially since the war, has been short of protein but the production of the sweet lupin has made it possible to produce at least 250,000 tons of protein annually, thus supplying 20 per cent of Germany's imports. An increase in protein content from 2 to 3 per cent is possible in the potato and this would make a further annual increase of 400,000 tons of protein. An increase in oil production on similar lines is also desirable.

641. GOVOROV. 633:575:631.524.2  
(Utilization of the world collections of cultivated plants in agricultural breeding.)

Semenovodstvo (Seed Growing) 1934 : No. 2 : 31-34.

Soviet breeders very rightly turned their attention first to the local material, which by selection has furnished a number of improved strains. Not however to the extent required by Soviet agriculture and the time has now come to turn seriously to the world collections of types. These must not be merely classified but studied from the point of view of their genetical construction and diversity and the historical and geographical factors that have led to their evolution. Only so can the full use be made of them in hybridization, and of the many new characters thereby revealed. It is important that the breeder should study and observe his material throughout the life cycle, from germination to maturity, and so gain insight into the true qualities of the races, rather than confining his attention to the end products, to yield and the like. Lyssenko's method of studying the individual stages of development illustrates the value of this mode of study. Evaluation of the local types should be made by comparison with the world collection, which will bring into relief any special defects or merits they may possess.

The author opines that the ecological variability of any given crop must be less than its morphological variability. Ecological variability can be best produced by crossing ecologically (geographically) different races.

The task now confronting Soviet breeders is the thorough classification and grouping of the types and the formulation of a plan of the most suitable combinations of parents for hybridization, then to apportion the work to the different breeding stations, which will study the progeny from the point of view of their internal and agronomic characters. There will follow an interchange between the stations of segregating populations on which local selections will be made.

642. BUILIN, D. P. 633:575:631.67  
**(Irrigation of the Trans-Volga and problems of breeding.)**  
 Semenovodstvo (Seed Growing) 1934 : No. 2 : 38-39.

Irrigation makes it possible to effect a much closer control of cultural conditions and it is recommended that the world collections of wheats and other crops should be grown under different conditions of moisture, manuring, time of sowing, spacing, etc., whereby a true appreciation of the value of the different types as parents will be made possible.

643. ALDANOV, A. D. 633:575:631.67  
 633.11:575(47)  
**(Some of the breeding problems in connexion with the irrigation of the Trans-Volga.)**  
 Semenovodstvo (Seed Growing) 1934 : No. 3 : 21-23.

The characters and qualities of the grain of cereals and other seed crops are materially altered by growing under irrigated conditions and the relative yields of the varieties may be entirely changed. The wheats for the new irrigated areas of the Volga basin are required to possess high yielding capacity and response to manuring, high protein content (a character adversely affected by irrigation), milling and baking quality, resistance to shedding and lodging and to various fungous and bacterial diseases.

Some of the varieties bred in the non-irrigated areas have proved quite promising, e.g. *erythro-spermum* 02 produced at Saratov from crosses between *Triticum durum* and *T. vulgare*, which has exceeded all other soft wheats in yield. Under irrigated conditions *T. durum* outyields *T. vulgare* and is attracting attention, both for breeding direct and for crossing with *T. vulgare*. The method of vernalization makes possible a very much wider range of parents.

Winter wheat, which yields much higher, would be preferable to spring wheat if sufficiently frost-resistant forms could be found. This, combined with the improvement of the quality of winter wheat, is a problem that will probably be solved by means of interracial, interspecific and intergeneric hybridization and the *Triticum-Secale* and *Triticum-Agropyrum* hybrids at Saratov are of extreme interest in this connexion.

Lucerne and sweet clover are also occupying attention.

#### CEREALS 633.1

644. GESCHER, N. VON 633.1:575.42(45)  
 633.1:575(45)  
**Cereal selection in the Mediterranean countries. (1) Italy.**  
 Int. Rev. Agric. 1934 : 25 : T528-36.

The development of selection work applied to wheat, rye, oats, barley, maize and rice is traced and the use that the research institutes at Rome, Bologna, Pisa, Vercelli and other centres have made of the numerous local varieties in improving these cereals is described.

Selection is however gradually being replaced by hybridization. The main objectives are early maturity, high yield and quality and disease resistance. The multiplication and distribution of selected seed is mostly carried out at Rieti and Bologna by special associations which are under the control of these two plant breeding centres.

645. HASEGAWA, N. 633.1:576.312.34:576.353  
**(Chromosome studies on the pollen nuclei of some cereals.)**  
 Jap. J. Genet. 1934 : 10 : 84-88.

Observations on the metaphase of the first division in pollen grains of *Aegilops*, *Triticum* (5 sp.), *Secale* and *Hordeum* (2 sp.) and certain morphological characteristics of their chromosomes.

646. BELJAEV, I. M. 633.1-2.7-1.521.6:575  
**(Breeding grain crops for resistance to frit fly.)**  
 Semenovodstvo (Seed Growing) 1934 : No. 3 : 23-26.

The method employed consists in selecting the plants which appear most favourable as regards low infestation, high yield and tillering. The lines are sown at the normal and two or more later

dates. The characters indicating resistance are of three kinds, firstly those preventing the insect from laying its eggs in the plant, such as a coleoptile closely appressed to the stem, dense pubescence, rapid growth and passage out of the susceptible phase, and early tillering; secondly those preventing the entry of the larva, such as a hard and thick outer layer to the stem, presence of silica, etc.; and thirdly the reaction of the plant to the entry of the larva, the damage being greater when growth and tillering are poor.

There are considerable varietal differences in susceptibility: *T. durum* varieties are commonly more infested than *T. vulgare*, largely owing to their slower growth in the two and three leaf stages and also to the fact that the coleoptile does not enclose the stem so closely as in *T. vulgare*. In breeding, attention should be given also to the later formed stems which are entirely without protection.

*T. Timopheevi* has displayed an unusual degree of resistance, its infestation in late sowings in 1933 being 13 per cent as compared with an average of 44 per cent in the other wheats. Its dense pubescence, consisting of hairs 1.5-2 mm. in length on the leaves and young stems, i.e. almost the length of the insect itself, and its hard stems are the probable causes of the resistance of this species.

### WHEAT 633.11

647. CLARK, J. A. and BELL, M. A. 633.11 Comet  
Comet wheat. 633.11:575(73)

U.S. Dep. Agric. Bur. Pl. Ind. 1934: Pp.2.

Comet wheat is derived from a cross between Marquis and Hard Federation. Data are given on the nursery yield, protein content and protein per acre of Comet and its parents.

648. CRÉPIN, C. 633.11 P.L.M. 1  
L'amélioration de la valeur boulangère de nos blés. (The improvement of the baking quality of our wheats.) 633.11:664.641.016(44)  
J. Agric. Prat. Paris 1934: 98: No. 29: 52-54.

The variety P.L.M.1 selected in 1927 from a land wheat of the name Mouton, combines a number of valuable qualities, such as earliness, resistance to rust and to cold and high baking quality.

An experiment was made by mixing 20-25 per cent of flour from this variety with ordinary flour. The result has been so successful that the miller who did the experiment has ordered the whole of the available supply of this variety from the 1934 harvest.

Various other productive wheats of high quality are in course of multiplication.

649. JAKUBZINER, M. M. 633.11 *T. Timopheevi*  
[Wheat resistant to fungous diseases (*Triticum Timopheevi* Zhuk.).] 633.11-2-1.521.6:575.127.2  
Bull. Appl. Bot. Leningrad 1934: Ser.A(11): 121-30.

*T. Timopheevi* Zhuk. is found growing in high mountainous regions at 300-1,000 m. It occurs in Georgia as a frequent mixture with einkorn and spelt but N. I. Vavilov now concludes that it is of more southerly origin. It occurs in regions of relatively high rainfall, warm winters and hot summers. The main characteristics of the species are its pronounced pubescence, the unusual length of the flowering glume, thinness of the stem bearing the ear, and extreme density of the ear. It has characteristics in common with *T. monococcum*, *T. dicoccoides*, *T. dicoccum*, *T. turgidum* and *T. durum*. A description of the species is given.

Its extreme disease resistance is the most valuable feature of this wheat: all forms tested were practically immune to *Puccinia glumarum*, *P. graminis* and *P. triticea*. It has been equally free from attack by mildew and the smuts and under certain conditions also to frit fly and wheat stem-fly.

It is a species of extreme promise therefore for breeding for disease resistance. It crosses least successfully with *T. monococcum*, slightly better results have been obtained in crosses with *T. durum* v. *apiculatum*. With *T. persicum*, *T. turgidum*, *T. polonicum*, *T. dicoccum* and *T. dicoccoides* the percentage success was 0-0.004. Hybrids were obtained by the author in 1933 from

*T. Timopheevi* v. *viticulosum* No. 8360 x *T. vulgare* v. *erythrospermum* No. 22880; the hybrids were without the resistance characteristic of *T. Timopheevi* though many of the morphological characters of this species were dominant. Further interspecific crossing is being undertaken and the method of triple crossing proposed by Kostoff is to be tried, consisting of crossing the hybrids with a third species of such chromosome number as to restore the balance of the chromosome numbers, e.g. *T. Timopheevi* ( $n = 14$ ) x *T. vulgare* ( $n = 21$ ) would be crossed with *T. monococcum* or *T. aegilopoides* ( $n = 7$ ).

650. NICOLAS, G. 633.11:575(44)  
L'amélioration du blé dans le Sud-Ouest de la France. (Wheat improvement  
in the South West of France).

Rev. Sci. Paris 1933 : No. 24 : 740-42.

The three factors most perilous to wheat cultivation in the South West of France are lodging, rust and damage by heat. The author has attempted to produce varieties better adapted by means of both selection and hybridization. Hybridization with a large number of different varieties, French and Italian, was begun in 1922. These together with a number of natural hybrids of Ardito have been studied and selected. In 1932 the yields obtained from these new selections were 25-53 quintals per sqr. metre whilst the best average yield from the districts was 10-64 and the worst 9-00.

Efforts are also being made to improve the quality of the wheats.

651. NAVOLOTSKII, A. V. 633.11:575:551.566.3  
(Methods of breeding spring wheat in the north of the U.S.S.R.).

Semenovodstvo (Seed Growing) 1934 : No. 2: 34-38.

In many respects the soil and climate of the northern part of the U.S.S.R. are more suited to wheat cultivation than the more southerly arid regions. Owing to the rigorous conditions of the northern non-chernozem belt however very few races have survived and most of them are defective in yield or some other important respect. Only in the southern section of this belt are more favourable forms found, such as the form *Triticum vulgare rossicum*, which in addition to being adapted to the local conditions has quite good quality of grain, tillering capacity and other biological features. Such local material must form the basis of all breeding work but any real improvement will only be brought about by hybridizing with forms of greater quality, yielding capacity, standing capacity, and free from shedding and diseases. The main problem is to unite yielding capacity with earliness. In addition to the local early varieties attention is being given to the early varieties produced in Canada and by the Leningrad Institute of Plant Industry, combining extreme earliness with superior grain quality. It is also proposed to use these latter Soviet wheats for crossing with squarehead forms for improving their grain quality; crossing them with winter wheats has already given promising results in increasing their cold resistance, yield and other characters without reduction in earliness. The mountain wheats from the North Caucasus and Asia Minor also make promising parents in view of their low temperature requirements, earliness etc.; these wheats moreover do not retard their maturity on account of the long day as do the wheats from the plains.

Crosses between the various species of the 28 chromosome group may also be promising, if they could produce a hard wheat type with greater reliability of yield, and the *Triticum-Agropyrum* hybrids may prove to be a very important step in the production of wheats for the north.

652. MEISTER, G. K. and ŠEKHURDIN, A. P. 633.11 *T. durum*:575:581.46  
633.11:575.127.2(47)

(Breeding hard wheat for awnlessness).

Semenovodstvo (Seed Growing) 1934 : No. 3 : 6-10.

Crosses between *Triticum vulgare* and *T. durum* have been made with the object firstly of producing a soft wheat with vitreous grain and this was achieved when in 1928 such wheats were

distributed for testing. Of these varieties two have proved outstanding, namely "Blansar," one of the best quality grains in the world, and "Sarrubra" characterized by white vitreous grain of excellent milling and baking quality and high yield. It is awnless and free from shedding but slightly susceptible to *Ustilago nuda*.

The other object of the cross was to produce an awnless *T. durum* equal in quality and yield to the best standard hard wheats. The hybrids of the *durum* type contained a number of awnless segregates as follows: out of 259 plants 58 were awned, 158 awnless and 43 intermediate. Thus it is possible to obtain awnless *T. durum*, though in nature these hardly exist, for even those found in Abyssinia only occur as occasional admixtures and never as pure populations. None of them, moreover, is suitable for direct introduction and much breeding work would be required to convert them into useful forms.

The awnless *durum* forms that segregate in the third and fourth generations of the interspecific cross are invariably inferior in yield and in size and quality of grain. Certain selections from a number of crosses and natural hybrids obtained in 1918 and of other hybrids made in 1922 were however examined. Data are tabulated shewing the yield and vegetative period in 1932 and 1933 of a number of the hybrids compared with two standard varieties which served as the parents in most of the crosses. All the hybrids were slightly earlier than the *T. durum* parent, which is a great advantage in arid districts. The yield of the hybrids varied from 11.5 to 13.4 centners per ha., i.e. a considerable increase on 10.8, the yield of the *T. durum* standard. Very few of the hybrids approached the *T. vulgare* standard in yield but the hybrids were equal to *T. durum* in size of their grain, which was identical in vitreousness and colour, though somewhat more rounded in form. In loaf volume, porosity and colour of bread the hybrids were equal and in some cases superior to the best Soviet *durum* 0432 and definitely superior to an average *T. vulgare*; they also had a higher bushel weight.

The best of these hybrids are now considered suitable for distribution. Their tall and not very strong straw is the main defect, to overcome which they are going to be crossed with the Abyssinian awnless *T. durum*, which is expected also to increase their earliness and tillering capacity.

653. POWERS, L.

633.11:575.11 "793"

**The nature and interaction of genes differentiating habit of growth in a cross between varieties of *Triticum vulgare*.**

J. Agric. Res. 1934 : 49 : 573-605.

The results analysed are based on a study of 380  $F_3$  families from the cross Hybrid 128 x Velvet Node. The methods used for the statistical analysis are described.

The genotypes of the  $F_2$  suggested that the parents were differentiated by three factor pairs for habit of growth and to test this assumption the  $F_3$  families were grouped according to the genotypes of their  $F_2$  parents. The results fully confirmed the presence of three main factor pairs and modifying factors for earliness are probably also present. The effect of seasonal changes upon the factors determining winter and spring habit of growth and the interaction of these factors in the parents were studied by planting the  $F_2$  generation on three dates, February 28, April 4 and May 4.

The results, which are discussed in detail, shewed that of the three factor pairs *AA*, *BB* and *cc* were factors for spring habit of growth and their allelomorphs determine the winter habit. These factor pairs differ in their reaction and are not duplicate factors. *A* is epistatic to *b* and *C*, *B* is epistatic to *a* and *C* and *c* is epistatic to *a* and *b*. *AA* was found to be more efficient in causing early maturity than *BB* and *cc*, while *CC* behaved as an inhibitor of maturity.

The effect of the interaction of these genes is interpreted on the basis of Goldschmidt's assumption that genes determining the same physiological character may differ in the rate at which the reaction proceeds.

The environmental conditions are largely responsible for the determination of the reaction processes of the different genes.

The possible origin and later modification of such a set of genes controlling growth habit through polyploidy is discussed.

654. JASNOWSKI, S. 633.11:575.11-183  
O dziedziczeniu ciężaru ziarna u *Triticum vulgare* L. (On the inheritance of weight of grains in *T. vulgare* L.)  
Roczn. Nauk Rol. 1934 : 33 : 59-68.

Crosses between the three varieties of *T. vulgare* shewed that three cumulative factors are concerned with the inheritance of grain weight. There was no correlation between weight of grains and number of grains per spikelet or number of spikelets per ear but the weight of ear was found to be dependent upon the weight of grains.

655. MORITZ, O. 633.11:575.127:615.37  
633.11 *Aegilops* : 575.127:615.37  
Über serologische Verwandtschaftsforschung. (Serological research on relationship).  
Züchter 1934 : 6 : 217-21.

The value of the serological method for the plant breeder lies in the possibility of determining the origin of cultivated plants, their relationships and hybrid nature. The method in use at Kiel is described and illustrated by results of work on *Triticum* and *Aegilops* species and on certain of their hybrids.

656. DUSSEAU, A. 633.11:575.127.2  
633.11-2-1.521.6:575.127.2  
Sur une nouvelle lignée hybride durelloïde issue du croisement de deux "*Triticum vulgare*." (On a new durelloid hybrid line from a cross of two *T. vulgare* forms.)  
C. R. Acad. Sci. Paris 1934 : 198 : 847-48.

From the cross *T. vulgare erythrospermum* K. x *T. vulgare lutescens* K. from which the *T. haplodurum* previously described (Cf. "Plant Breeding Abstracts," Vol. IV, Abst. 656) was derived another durelloid strain V<sup>26</sup>-1-2 has been obtained. The plant bears a general resemblance to the *T. durum* type, but the grain though vitreous is a soft wheat from the biometrical standpoint. It is entirely resistant to *Puccinia glumarum* and only slightly susceptible to *P. graminis*, *Tilletia* sp. and *Ustilago tritici*.

The chromosome number in the new strain was  $2n = 28$  like that of the other similar forms (Cf. "Plant Breeding Abstracts" Vol. V, Abst. 312).

657. DUSSEAU, A. 633.11:575.127.2:576.354.4  
Etude cytologique d'un hybride de deux *Triticum vulgare* Host, à phénotype de *T. durum* Desf. (Cytological study of a hybrid of two strains of *Triticum vulgare* Host., with the phenotype of *T. durum* Desf.).  
Cytologia, Tokyo 1934 : 5 : 491-97.

The morphological and cytological peculiarities of *T. haplodurum* already noted (see "Plant Breeding Abstracts," Vol. III, Absts. 54 and 620 and Vol. IV, Abst. 655) are again described. It is suggested that such a phenomenon as a constant line with the phenotype of *T. durum* and the 14 somatic chromosomes of *T. monococcum* can be explained by assuming the loss of the A and C genomes characteristic of the *monococcum* and *vulgare* groups respectively.

658. BERG, K. H. VON 633.11:575.127.2:576.356  
633.11:575.129  
Cytologische Untersuchungen an den Bastarden des *Triticum turgidovillosum* und an einer  $F_1$  *Triticum turgidum* x *villosum*. (Weitere Studien am fertilen konstanten Artbastard *Triticum turgidovillosum* und seinen Verwandten.)  
[Cytological investigations on the hybrids of *T. turgidovillosum* and on an  $F_1$  *T. turgidum* x *villosum*. (Further studies on the fertile constant species hybrid *T. turgidovillosum* and its related forms.)]  
Z. indukt. Abstamm.-u. VererbLehre 1934 : 68 : 94-126.

Details are given of the reduction division in the pollen mother cells of the  $F_1$  *T. turgidum* x

*T. villosum*, a cross made in 1931. In the early stages of the first division the univalents divided longitudinally without exception and were regularly distributed to the poles, in the second there is no further division but all the chromosomes are included in a restitution nucleus. As the anthers of the  $F_1$  hybrid fail to dehisce the good pollen is unable to function; crosses and back-crosses were therefore made with later generations of *T. turgidovillosum* as the male parent and there was further evidence for the occurrence of  $\varnothing$  gametes with the somatic chromosome number.

Meiosis in hybrids of *T. turgidovillosum* with *T. durum*, *T. vulgare*, a wheat-rye hybrid and the  $F_1$  *Aegilotriticum* II respectively is described and the data confirm the didiploid nature of *T. turgidovillosum*.

As a prelude to the general discussion the author gives useful definitions for the terms genom, chromosome complement, diploid, etc., as there exists in the literature a certain amount of confusion due to the present rapid growth of knowledge.

The formation of gametes with somatic number of chromosomes is discussed with special reference to the origin of *T. turgidovillosum*. *T. turgidovillosum* represents the didiploid condition formed by the union of two dihaploid gametes and its cytological and genetical behaviour combined with its stability and complete fertility entitles it to be ranked as a new species.

659.

633.11:575.127.2:576.356

633.11:575.127.5:633.11 *Aegilops* : 576.356

LILIENFELD, F. and KIHARA, H. 633.11:575.127.5:633.14:576.356

Genomanalyse bei *Triticum* und *Aegilops*. V. *Triticum Timopheevi* Zhuk.(Genom analysis in *Triticum* and *Aegilops*. V. *T. Timopheevi* Zhuk.)

Cytologia, Tokyo 1934 : 6 : 87-122.

*T. Timopheevi* is a tetraploid wheat placed by Flaksberger in the emmer group but a striking pubescence of the leaf sheaths and laminae and a tendency of the palea when ripe to split along the median line differentiates this species sharply from all others of the group.

A cross between *T. Timopheevi*  $\varnothing$  and *T. aegilopoides*  $\delta$  gave 36 grains (60 per cent) of which 30 (83 per cent) germinated. In the reciprocal cross fertility was almost complete but germination, as expected, was not so good. In the first metaphase of the pollen mother cells 4-7 bivalents were observed, six being the most general number. Multivalent associations were not infrequent. The cross between the emmer wheat *T. pyramidale* x *T. aegilopoides* was also investigated for comparison. In the first metaphase 4-7 bivalents were also observed with six as the most frequent. Both combinations were completely sterile. The A genom of *T. Timopheevi* like the  $A_{Em}$  genom is therefore not a true homologue of  $A_{Eink}$ . *T. Timopheevi* was crossed with the following species of the emmer group, *T. pyramidale*, *dicoccum*, *persicum*, Vav. var. *stramineum* Zhuk. and *durum* with the cross *T. pyramidale* x *durum* for comparison. The results of a number of crosses within the emmer group are also reviewed.

The results fall into two distinct groups. In the first group of species within the emmer series there is regular pairing and good fertility with no more irregularity than is found in the parent species. The other group which consists of the crosses *T. Timopheevi* with the species mentioned, shews bivalents varying from 7-14 in a much looser association for the most part and a consequent lowering of the fertility to a high degree of sterility. The conclusion is therefore reached that *T. Timopheevi* possesses a genom complement which differs from that of the wheats of the emmer group. It is suggested that the A genom of *Timopheevi* is probably identical with the  $A_{Em}$  genom but the other, symbolized by X is not homologous with  $B_{Em}$ .

*T. Timopheevi* crossed with *T. vulgare* gave the surprising result that every grain set when *T. Timopheevi* was the female parent but they all shrivelled up during ripening and none germinated. In the reciprocal cross no fertilization occurred. There was the same result when *T. Spelta* was substituted for *T. vulgare*.

It is therefore still an open question whether the X genom can be identified with the D genom of the *vulgare* species.

Crosses between *T. Timopheevi* and species of *Aegilops* representing the D, S, C, E and F genoms shewed that the X genom was homologous with none.

In a cross between *T. Timopheevi* ♀ and *Secale cereale* ♂, 56 grains were obtained from 80 flowers. The ripe grains were, however, shrivelled and did not germinate. The reciprocal cross gave no grain. The X genom therefore cannot be identified with that of rye. A discussion of the results leads to the conclusion that *T. Timopheevi*, on morphological as well as karyological grounds, is to be separated from the rest of the emmer group.

660. OEHLER, E. 633.11:575.127.5:633.11 *Aegilops* : 575.129  
 Untersuchungen an drei neuen konstanten additiven Aegilops-Weizenbastarden.  
 (Investigations on three new, constant additive *Aegilops*-wheat hybrids.)  
 Züchter 1934 : 6 : 263-70.

In the  $F_2$  of the cross *Ae. caudata* var. *polyathera* ( $n = 7$ ) x *T. dicoccum atratum* ( $n = 14$ ) were found 12 plants exactly resembling the  $F_1$  and whose progeny were also constant. The morphology of these plants is described. They were fairly fertile and a cytological examination shewed that each plant had a somatic chromosome number of 42 and that the reduction division was quite regular.

Crosses between the two varieties of *Ae. triuncialis* ( $n = 14$ ) *typica* and *constantinopolitana* with *T. dicoccum* ( $n = 14$ ) *atratum* gave in  $F_2$  in the first case eight, in the second two plants identical with the  $F_1$  from which constant  $F_3$  plants were obtained. These were fairly fertile and are morphologically described. Cytologically examined the plants all shewed that the chromosome number was  $2n = 56$  and that the reduction division was normal.

The third form occurred in the  $F_2$  of the cross *Ae. triaristata* v. *attenuata* ( $n = 21$ ) and *T. vulgare erythrospermum* ( $n = 21$ ). Three plants differing from the  $F_1$  but almost identical with each other were found and gave a constant  $F_3$  progeny. They were self-fertile and had 56 somatic chromosomes.

The origin of these three constant types is discussed. In the first case an apogamous origin is thought to be most probable, in the second the union of two unreduced gametes and in the third case apogamy is also considered to be the most likely possibility.

661. MÜNTZING, A. 633.11:575.127.5:633.14:576.354.4  
**Triple hybrids between rye and two wheat species.**  
 Hereditas, Lund 1935 : 20 : 137-60.

Crosses between *T. turgidum* ♀ and rye ♂ gave 7 plants, a pollination percentage of 0.37. These plants had the somatic number 21 (7 rye + 14 *turgidum* chromosomes). As these hybrids were completely pollen sterile they were back-crossed to *T. vulgare* on the assumption that if functional ovules were produced they would be probably unreduced and contain 21 chromosomes. As a result 7 well developed kernels were obtained which gave five plants, three with  $2n = 42$ , one with  $2n = 41$  and one  $2n = \pm 40$ .

The main morphological characteristics of the *turgidum* x rye hybrids and of the triple hybrids are briefly described. On the whole, the hybrids were intermediate.

The triple hybrids with 42 chromosomes were partially pollen fertile and a small number of unreduced male gametes probably occurred. Self-fertilization produced an average of about one grain per ear and the grains were of varying quality. Fifteen seedlings were finally obtained. In the eight plants examined the chromosome number ranged from 39 to  $\pm 48$ . First metaphase stages only of meiosis were studied.

The most frequent configuration was  $14_{II}$  and  $14_I$ . But variable numbers of univalents, bivalents, trivalents and quadrivalents were observed. The bivalents were rod-shaped or ring-shaped with 1-3 chiasmata.

The results are discussed from the point of view of the relationships between the species and genera concerned.

662. VAKAR, B. A. and KROT, E. G. 633.11:575.127.5:633.14:576.354.4  
**A cytological study of constant wheat-rye hybrids.**  
 Cytologia, Tokyo 1934 : 5 : 395-416.

Two races of constant wheat-rye hybrids were used in this study, *Erythrospermum* 46/131 and *lutescens* 27/36. Their yield was as much as the average for winter wheat which suggests a

normal fertility. Both hybrids had 42 2n chromosomes. During meiosis a number of irregularities were observed, including up to six univalents. Much of the pollen was also deformed and deficient in cytoplasm.

It is suggested that the occurrence of univalents is due to segmental interchange between three rye and three wheat chromosomes.

The high yield of the hybrids in the field indicates that a sufficiency of normal pollen is produced and it is concluded that meiosis in the egg cells is regular to a great extent.

663. BUCHHEIN, A. N. 633.11:575.127.5:633.14-2.451.3

(The reaction of rye-wheat hybrids to smut.)

Semenovodstvo (Seed Growing) 1934 : No. 2 : 43-44.

The experiments of 1930-1931 shewed that the wheat-rye hybrids are not attacked by *Urocystis occulta* and are about equal to winter wheat in attack by wheat smut, though many of the plants shewed only partial infection. Selection was therefore started in the attempt if possible to increase this partial resistance. The results of 1931-32 shewed that the degree of infection was increased when spores were taken from the wheat-rye hybrids. The plants obtained from seed of unattacked plants were more resistant, with a percentage attack of 10, than those from partially attacked plants, which gave an attack of 12.1 per cent, compared with control plants of unselected wheat-rye hybrids, giving 10.5 per cent, and winter wheat, giving 14 per cent attack. In 1933 the plants from partially attacked parents had an attack of 31.5 per cent.

Thus it is not advisable to select partially attacked plants, which are seen to give more susceptible progeny than sound plants. The partial attack is thought therefore to be due to imperfect infection on the part of the fungus and not to a partial degree of resistance of the plant.

The Saratov *Secalo-triticum* tetraploid in one plot escaped infection altogether but in another plot was attacked 22 per cent and 2.6 per cent in 1932 and 1933 respectively, spores for infection in both years being again taken from the rye-wheat hybrids.

664. CÂMARA, A. de Sousa da 633.11 *T. monococcum*:576.312.34

Um estudo citológico do "*Triticum monococcum*" L. (A cytological study of *T. monococcum* L.).

An. Inst. Sup. Agron. Lisboa 1934 : 6 Fasc. 2 : Pp. 36.

The author points out the error of basing conclusions as to the phylogenetic relationships between the wheat species on one race alone of any of the species, in view of the karyological variation observed by various authors within the species in a number of other genera. A karyological study was therefore made of two varieties of *T. monococcum*. The morphology of the chromosomes was made much clearer by previous treatment with chloral hydrate and preliminary experiments shewed that this in no way altered the relative proportions of the arms of the chromosomes. The methods of examination and mensuration of the chromosomes are described. The author agrees with Lewitsky that the length of the chromosome should be measured by the length of a single chromatid, not by the longitudinal axis of the chromosome because of errors due to torsion.

In *T. monococcum* var. *vulgare* Körn. five types of chromosomes were encountered in the ten cells examined, corresponding to the five types described by Kagawa, whose figures are given for comparison. The two sets of figures shewed a close approximation except in certain details, and here the discrepancy may be due either to difference in method or to difference in the strains used. In *T. monococcum* var. *Hornemannii* Körn. the chromosomes were generally analogous in regard to the position of the main constriction but were greater in length, the chromosomes of the variety *vulgare* only occasionally reaching the typical length of those of the variety *Hornemannii*. Moreover there was an unmistakable difference in the position of the constriction in chromosomes IV and V.

The chromosomes contain sub-terminal and sub-median secondary constrictions, which according to Lewitsky is a sign of an advanced stage of evolution.

The treatment with chloral hydrate produces a much more pronounced contraction in the chromosomes of *Triticum* than in *Aegilops*. No difference however was observed in the behaviour of the chromosomes of the hexaploid wheat species, as might be expected had *Aegilops* contributed to their origin. The indispensability of karyotypical studies of this kind for the solution of the problem of the systematics and origin of the wheat species is emphasized.

665. MUDRA, A. 633.11:576.341  
 Untersuchungen über Zellsaftkonzentration beim Weizen. (**Investigations  
 on the concentration of the cell sap in wheat.**)  
 Z. Zücht. 1934 : A 20 : 62-71.

The importance of the concentration of the cell sap in resistance to cold has already been investigated by the author (see "Plant Breeding Abstracts" Vol. III, Abst. 386). In the present paper an analysis of the cell sap is made the means of distinguishing between xerophytic and hygrophytic varieties.

666. CHIZAKI, Y. 633.11:576.356.52  
**Another new haploid plant in *Triticum monococcum* L.**  
 Bot. Mag. Tokyo 1934 : 48 : 621-28.

A sterile haploid rice plant which occurred among the progeny of some plants that had flowered under abnormally high temperatures is described. A cytological study shewed seven univalents at the first division of the majority of the pollen mother cells. Two terminally joined univalents were occasionally observed. The chromosomes were distributed at random to the poles, 3-4 being most frequently seen.

From nought to seven chromosomes were observed at the second division metaphase at which the chromosomes divided longitudinally so that a pollen grain with seven chromosomes might occur.

667. MANGELS, C. E. 633.11:581.19:581.48:575.1  
**Varietal and regional variation in properties of wheat starches.**  
 Cereal Chem. 1934 : 11 : 571-85.

An investigation of the causal factors concerned in the variation of the chemical and morphological properties of wheat starches indicated the existence of a definite varietal or hereditary factor.

668. LOKSCHA, H. 633.11:581.9:576.16  
 Über Weizenbau auf pflanzengeographischer Grundlage. (**Wheat cultivation  
 on a phytogeographical basis.**)  
 Verlautb. deuts. Sekt. mähr. Landeskulturrat. 1934 : 35/11 : 64-66.

The importance of the geographical aspect as applied to varieties in the cultivation of agricultural plants is pointed out. The initial work in this field is due to Proskowetz and Schindler. For Moravia a map of natural wheat regions has been made from which four types can be recognized. Modern experimental work on wheat varieties should class the varieties into groups of the same type. These types should be cultivated in their natural areas of distribution according to phytogeographical considerations. The author mentions the danger of reducing the number of wheat varieties too far ; 4-5 varieties cannot be regarded by any means as sufficient. On the basis of 12 year experiments from 1921-1932 (summarized by Chmelař and Simon) Bohemia was divided according to the individual natural areas of cultivation into separate wheat growing districts ; in Moravia-Silesia actual natural agricultural areas of production were marked off ; in Slovakia and in the Russian Carpathian region the wheat districts were formed by amalgamating natural cultural areas. For each of the districts thus established the wheat varieties of proved value were arranged in 3 groups as winter, spring and alternative wheats and according to yield and quality ; in addition notes on the other important varietal characteristics were made for each variety. Finally the total area was sub-divided into very good, good, average, below average, poor and bad cultural regions for wheat. By this means valuable indications are provided for the practical agriculturalist. A.B.

669.

MAYR, E.

633.11-1.524.4:575(43.6)

633.16-1.524.4:575(43.6)

Erhaltung und Nutzbarmachung der in den alpinen Getreidelandsorten liegenden Zuchtwerte. (**Maintenance and utilization of the breeding material that is available in the land varieties of cereals in the Alpine districts.**)

Landeskultur 1934 : 1 : 102-03.

In the Alps a large number of old primitive forms of cereals are still cultivated. In some of these forms, e.g. Binkel wheat, the 6-rowed barley and einkorn, the period of cultivation dates back about 5,000 years and since then these forms have not been altered by breeding. These land varieties represent a very valuable initial material both for improvement and also for use in hybridization work. In order to have a reserve supply for these purposes it is essential to maintain these varieties in their original forms and in their original locality under the original conditions of cultivation. Unfortunately in most countries land varieties have disappeared but fortunately this is not so in the alps. As regards the Austrian-Alpine varieties of wheat, they are among those with the best qualities. Among the spring wheat varieties the Binkel group are the most valuable. In the barleys the particularly winterhardy 6-rowed barley of Montafon deserves special mention while for the mountain districts with their harsh climate the 4-rowed awned and 4-rowed naked barleys are of equal importance. These forms should also receive more attention for brewing purposes. A. B.

670.

MAINS, E. B.

633.11-2.421.1-1.521.6:575.11

633.11-2.452-1.521.6:575.11

**Inheritance of resistance to powdery mildew, *Erysiphe graminis tritici*, in wheat.**

Phytopathology 1934 : 24 : 1257-61.

The variety Norka, resistant to physiological form 1 of mildew was crossed with susceptible varieties and in each case resistance to form 1 behaved as a simple dominant.

Resistance to physiological form 3 of leaf rust (*Puccinia rubigo-vera tritici*) was studied in the cross Norka x Ceres. The resistance of Norka to this disease was also inherited as a simple dominant independently of the factor for resistance to mildew. The variety Red Fern is highly resistant to forms 1 and 2 of powdery mildew and resistance was inherited as a simple dominant. The resistance of Hope in the seedling stage to form 1 is inherited as a simple recessive factor as is also the resistance of Sonora and Michigan Amber.

671.

RUTILE, M. L.

633.11-2.451.2

633.16-2.451.2:576.16

**Studies on barley smuts and on loose smut of wheat.**

Tech. Bull. N.Y. St. Agric. Exp. Sta. 1934 : No. 221 : Pp. 39.

Reference is made *inter alia* to an intermediate or suspected hybrid type of barley smut and also to the possible existence of biological specialization within the smuts of barley.

672.

SHEN, T. H.

633.11-2.541.3-1.521.6:575.11

633.11:575.11

**The inheritance of resistance to flag smut (*Urocystis tritici* Koern.) in ten wheat crosses.**

Bull. Coll. Agric. For. Nanking 1934 : No. 17(N.S.) : Pp. 16.

Varieties were grouped according to their resistance to flag smut as (a) nearly immune, (b) resistant, (c) susceptible and (d) very susceptible; and ten crosses were made which could be classified into the four groups (1) nearly immune x very susceptible, (2) nearly immune x susceptible, (3) resistant x susceptible and (4) nearly immune x nearly immune. The results of the genetical data of the  $F_3$  and in some cases the  $F_4$  are examined in some detail especially in two crosses from groups 1 and 2. As the resistance or susceptibility of parental types was recovered in the  $F_3$ , it is held that the number of major genes determining resistance is not large and 3 is suggested as a working hypothesis. Resistance was found to be dominant or partially so to susceptibility.

The results suggested that the nearly immune parental strains carried some genes for susceptibility.

There were indications of transgressive segregation.

In investigations of the inheritance of awnedness, of pubescence of the glume and of glume colour, awnlessness, pubescence and brown chaff all behaved as simple dominants, and shewed no linkage with resistance to flag-smut.

673. ISENBECK, K. 633.11-2.452-1.521.6:575  
 Züchtung auf Feldresistenz beim Gelbrost des Weizens. (**Breeding for field resistance to the yellow rust of wheat**).  
 Züchter 1934 : 6 : 221-28.

The methods employed at the Institut für Pflanzenbau und Pflanzenzüchtung of Halle University for the testing of field resistance by artificial infection in the field are described.

674. KULKARNI, L. G. 633.11-2.452-1.521.6:575.11  
 633.11:581.45:575.11  
**Correlated inheritance with special reference to disease resistance in spring wheat.**  
 J. Amer. Soc. Agron. 1934 : 26 : 885-93.

Crosses were made between Hope (with a ligule) and a variety known as Liguleless. The results shewed the presence of two dominant duplicate factors either of which alone can determine the presence of a ligule. No close association was observed between the presence of a ligule and rust reaction.

The other experiments were made on crosses between a resistant hybrid from Ceres x Hope and a semi-resistant hybrid from Ceres x Double Cross.

The Hope type of resistance was controlled by a single factor pair. A study of the effect of rust resistance on plumpness of the grain shewed that though there was more shrivelling in the semi-resistant group than in the resistant group the results were significant only in the latter.

Yield was not significantly associated with rust resistance.

Tests of 192 relatively homozygous hybrid lines (with H 44 or Hope as one parent) for their seedling reaction to physiological forms 21 and 36 shewed a considerable amount of genotypical variation in 70 lines and re-selection is advocated.

675. SHEN, T. H., TAI, S. E. and CHIA, W. L. 633.11-2.6-1.521.6:575.11  
 633.11:575.11:581.46  
**A preliminary report on the inheritance of nematode resistance and length of beak in a certain wheat cross.**  
 Bull. Coll. Agric. For. Nanking 1934 : No. 19 (N.S.) : Pp. 17.

Kanred was chosen as the resistant parent and crossed with a susceptible selection of a native variety. Though some  $F_3$  families free from nematode damage were found, there was no clear segregation in this generation and the inheritance is assumed to be a complicated one.

The same parents were used for a genetical analysis of the inheritance of the length of beak on the glume. In Kanred this has a length of  $21.45 \pm 1.80$  mm. and in the native variety of  $2.63 \pm 28$  mm. There was partial dominance of the short beak over the long in the  $F_1$  and transgressive inheritance was observed in the  $F_2$  and  $F_3$ . It is suggested that not more than three genes are involved in this cross. No significant indication of linkage was found between length of beak and resistance to nematode.

676. KAZARYAN, S. 633.11:664.641.016(56.6)  
**(The wheats of Armenia and their properties.)**  
 Suppl. 70. Bull. Appl. Bot. Leningrad 1934 : Pp. 79.

The wheats of Armenia have proved of exceptional interest in view of their botanical diversity. In Soviet Armenia alone 99 botanical varieties of cultivated wheat have been found, including representatives of eight different species, though *Triticum vulgare* preponderates. Many wild

wheats have also been discovered. The wheats have been subjected to detailed botanical examinations, in addition to which the milling and baking qualities have been investigated and it is the latter with which the present monograph is concerned. Various Armenian wheats and a number of Soviet and foreign wheats were examined. Descriptions and tabulated data of the yield, thousand corn weight, bushel weight, vitreousness, flour extraction, water absorbing capacity, additional bread yield from a unit of flour, loaf volume, form of loaf and porosity over a number of years are given.

The spring varieties *T. vulgare caesium* III, *albidum* 604 and *lutescens* 62 were tested at the Eĉmiadzin station for five years, during which *lutescens* 62 was inferior to *caesium* III in quality but exceeded it by 13 per cent in yield, which more than compensated for the inferiority in quality. During four of these years the Armenian variety Galgalos (var. *Delfi* Körn.) was also compared and proved superior to the other varieties in quality, though inferior in yield. Its quality was also more constant in the different years.

Similar data are given for two *T. durum* varieties and five varieties of winter wheat from Soviet Armenia, one of which was the same variety Galgalos but sown in winter—together with a number of Soviet and Canadian winter varieties. Again Galgalos was superior to all other varieties in quality, with the possible exception of Kooperatorka, and in this case came a good first also in yield.

Similar observations were made at the Leninakan Station, where Galgalos proved inferior to the selected varieties, of which Ukrainka was the best both in quality and yield, but at Mgub Galgalos again gave the best results. The quality of all the varieties varied considerably in the different stations at which the tests were performed, though this variation was distinctly less in some varieties than in others.

The Armenian wheats were on the whole somewhat low in protein, ash and nitrogen content. The *durum* wheats were low in quality, the variety Dava-diĉi being the best, and *T. persicum* was also characterized by particularly low quality.

677. ROSENSTIEL, K. v. 633.11:664.641.016:575.11  
 Untersuchungen zur Genetik der Kleberqualität bei Winterweizen. (Vorläufige Mitteilung.) [Studies on the genetics of gluten quality in winter wheat. (Preliminary communication)].  
 Züchter 1934 : 6 : 261–62.

Real progress in breeding for baking quality has been made possible by the methods of Berliner and Koopman and of Pelshenke for testing small quantities of flour. In order to study the factorial basis of the inheritance of baking quality a modification of the method is described whereby tests could be made on 1 g. of meal. This makes possible a large number of preliminary tests of the material to be used for breeding and of tests on the  $F_2$ .

A number of crosses of winter wheats were made and the  $F_2$  progeny were grouped into two classes according to the "swelling number"  $<5$  or  $>5$ . The progeny of some of the crosses shewed a segregation which agreed with the presence of two recessive factors for quality.

In crosses between two varieties with good gluten quality one shewed the dominance of good quality, in the other, good quality was recessive. These surprising results can only be explained when the  $F_3$  data are available.

The strains recessive for good quality can be selected in the  $F_2$  and used as a basis for the selection of the other qualities desired.

678. WORZELLA, W. W. 633.11:664.641.016:575.11  
 The inheritance of quality in Trumbull and Michikof varieties of winter wheat.  
 J. Agric. Res. 1934 : 49 : 705–14.

The wheat-meal fermentation time test was used for the evaluation of the gluten quality. Tests made on the  $F_1$  endosperm of direct and reciprocal crosses shewed that the gluten strength was weak when Trumbull was used as the female parent and strong when Michikof was so used. The quality of the  $F_2$  endosperm in the  $F_1$  hybrids was intermediate.

The data on the  $F_2$  and  $F_3$  indicated that probably three major independent, cumulative factor pairs are involved in this cross and Trumbull represents the recessive type.

Inter-annual correlation coefficients made on the  $F_2$  and  $F_3$  data, indicated that determinations of the gluten quality of individual plant selections in the early generation are a reliable guide for selection for quality.

Significant positive correlations for time obtained between the results of different years on pure line and hybrid strains of wheat are additional evidence for the hereditary quantitative character of quality and for the accuracy of the fermentation test.

679. \*ENGELKE, H. 633.11:664.641.016:578.081

Ist die Feststellung der Gärkraft durch die Göttinger Weizenqualitätsprüfungs-  
methode möglich u. sicher? (**Is the determination of the fermenting  
power possible and certain by the Göttingen method for testing the  
quality of wheat?**)

Mühlenlab. 1934 : 4 : 137-42.

The Göttingen method for testing the quality of wheat is further described (see " Plant Breeding Abstracts," Vol. V, Abst. 342) and its capacity to determine accurately the power of fermentation is confirmed.

680. KAZARYAN, S. 633.11:664.641.016:578.081

(**Methodics of milling and baking tests in wheat.**)

Suppl. 69. Bull. Appl. Bot. Leningrad 1934 : Pp. 56.

The lack of uniformity in methods of determining the milling and baking qualities of wheats in different countries and even in different laboratories leads to grave discrepancies in the results. With the object of providing a uniform method at least for use in the Soviet Union the method employed at the Milling and Baking Laboratory of the Institute of Plant Industry, Leningrad, is described in detail.

### OATS 633.13

681. SCHATTENBERG, H. 633.13-2.451-1.521.6:575.11

Untersuchungen über das Verhalten von Sorten, Kreuzungsnachkommen-  
schaften und Kreuzungspopulationen gegenüber verschiedenen Herkünften  
von Haferflugbranden. (**Investigations on the response of varieties,  
hybrid progenies and hybrid populations to samples of loose smut  
of oats, from various sources.**)

Kühn Arch. 1934 : 37 : 411-49.

Using over 50,790 plants of a collection of six varieties for testing pathogeneity, 39 samples of loose smut (*Ustilago avenae*) of home and foreign origin were investigated and 12 groups ranging from highly virulent to very weak types were established. Incidentally it was found that the pathogeneity of a sample is specific for a particular variety of oats, so that a sample defined in general as weak might severely infect a highly resistant variety. Also immunity of oats to loose smut is a varietal character.

A study of the inheritance of loose smut resistance was made with material comprising the progenies of 9 oat crosses and 145,919  $F_3$  plants. Parallel tests with weakly as well as strongly virulent collections were made in all crosses except one.

The results shewed monofactorial, bifactorial and trifactorial inheritance of resistance, which appeared to be dominant. The progenies that shewed the highest percentage of infection were those derived from parents that were most highly susceptible.

No transgression towards resistance was observed in crosses of highly susceptible parents ; and no resistant lines could be isolated by selection among susceptible progenies.

The selective effect of the fungus when successive progenies are infected was tested with 11,359 plants and the expected reduction in the number of plants attacked in the later generation was found.

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\*A full translation of this paper is on file at the Bureau.

682. LEONT'EV, V. M.

633.13-2.452-1.521.6:575.127.2

**(New varieties of oats resistant to rust.)**

Semenovodstvo (Seed Growing) 1934 : No. 3 : 30-32.

From crosses between the American White Tartarian oat and *Avena byzantina* from Africa, carried out at the Central Chernozem Breeding Centre, segregation for such a large number of different characters was obtained that the hybrid populations in many respects exceeded the world oat collection in diversity. Selections were made and the best of these in 1933 proved superior in yield to the varieties selected by other stations in the Soviet Union, Europe and America. Tabulated data are given shewing the yield for 1932 and 1933, the thousand corn weight, percentage husk, vegetative period and degree of infection. Yields of 42.2, 39.2 and 35.0 centners per ha. were obtained from the three immune hybrids in 1933, compared with 30.0 for the highest and 13.1 for the lowest of the non-immune hybrids and 4.9 for White Tartarian. The superior yield is therefore ascribed to the rust resistance, as 1933 was a bad rust year. The thousand corn weight was also considerably higher in the immune varieties.

Further selection is now being carried out for thin husk and the indications are that this will be successful without the need for back-crossing.

## RYE 633.14

683. PRJANIŠNIKOVA, Z.

633.14:575.14

**(Inbreeding and the percentage seed formation in rye.)**

Semenovodstvo (Seed Growing) 1934 : No. 2 : 40-42.

Ears of Vyatka rye were isolated in parchment bags and seeds obtained by self-pollination. The plants produced displayed various anomalies including narrow and broad leaves, different thickness of straw, absence of wax, pubescence of stem below the ear, dwarfing, and also forms almost without awns and others with very long rough awns ; there were also forms with short, round grains and others with elongated grains. By selection in the selfed progeny it was possible to obtain lines with ears as long as and longer than those of the original Vyatka. The progeny shewed great variation in density of ear and in the set of grain per ear. The set diminished markedly in succeeding inbred generations, though different lines in the progeny of a single individual varied greatly in this respect, e. g. one line gave percentage sets of 73.0, 66.4 and 54.2 in 1928, 1929 and 1930 respectively, whilst a sister line from the same family gave 57.4, 34.8 and 30.0 per cent. After six inbred generations no line was free from the tendency to decrease the percentage set. By selection however it was possible to maintain the average set unimpaired over a number of generations, though no actual increase was ever observed. Thus the following percentage set was obtained in lines selected for high set in the five years from 1928 to 1932 : 72.4, 62.1, 65.7, 70.0 and 64.0 per cent respectively. Even these selected lines ( $I_8$ ) however in 1933 shewed signs of deterioration. The size of the grain also suffered concurrently with the percentage set. On the other hand some of these lines were vegetatively very vigorous and tillered luxuriantly.

The Moscow Breeding Centre in 1932 carried out diallel crosses between the twelve best lines and these were repeated in 1933. Some of the  $F_1$  combinations exceeded the original Vyatka in set of grain and studies are being made on the possibilities of maintaining this improvement. The authoress ends with the following questions : is it possible by inbreeding to isolate a form superior or even equal in yield to the original population ; how long can such a form, if obtained, be maintained unimpaired by continuous inbreeding ; and is there any point in attempting to obtain homozygous lines in breeding cross-fertilized plants ?

684. KRASNJUK, A. A.

633.14:575.14:575.12

**(On the question of diallel crossing in rye.)**

Semenovodstvo (Seed Growing) 1934 : No. 3 : 11-15.

Self-pollination of any cross-fertilized plant produces a variety of types never, or only very rarely, found in the parental population, some of them valuable, like early forms, forms resistant to various diseases etc., others undesirable. Owing to the loss of vigour on inbreeding, the value of the inbred lines as parents can only be determined by experiment and for this the method of diallel crossing, in which the different lines are crossed one with the other in pairs, is employed.

In 1931, 143 combinations were made, of which 80 per cent were infertile; the total percentage set was only 2.2 per cent. By isolating the ears of the male and female parents together the percentage of successful combinations was raised to 41.8 per cent and the percentage set to 18.4. Heribert Nilsson's method gave 78 per cent successful combinations and 37.5 per cent set. This method however, which consists in the exchange of isolators from one parent to the other, is not effective when the female parent possesses a high degree of self-fertility.

The method of diallel crosses is described. The lines are sown in rows of 12 seeds at a spacing of 22.5 cm. They are arranged in groups, each group containing one paternal line with two maternal lines, one on each side. At Saratov the crossing is done in two ways, by placing the male and female inflorescences under the same isolator or emasculating the female parents, if they are very fertile, and introducing an ear of the male parent or a whole plant into the isolator. Since rye does not lose its capacity for fertilization by foreign pollen for a fortnight, a slight discrepancy in time of flowering is not important. The former method, though it does not give such pure progenies, is regarded as sufficiently good for practical breeding.

The hybrid material it is proposed to treat in various ways, inbreeding, complex crossing between hybrids and direct multiplication of the best lines being the principle suggestions.

685. FRIMMEL, F. and BARANEK, J. 633.14:575.4  
Beitrag zur Methodik der Roggenzüchtung und des Roggensaatgutbaues. (A  
contribution to the technique of rye breeding and seed production.)  
Z. Zücht. 1934 : A 20 : 1-22.

The literature is surveyed on the origin of rye, its development as a crop plant, anthesis and vicinism, inbreeding and heterosis, and variability. The opposing aims of selection for breeding purposes and for seed production are discussed and a method of rye selection based on the "Miss America principle" is described.

686. HASEGAWA, N. 633.14:576.312.35  
A cytological study on 8-chromosome rye.  
Cytologia, Tokyo 1934 : 6 : 68-77.

An examination of 7-chromosome rye shewed 7 bivalents which behaved in a regular manner. At first metaphase three of the seven chromosomes had a sub-median constriction, three a median constriction and the remaining one was divided into one long and one short arm with an appendage attached to the proximal end of the latter.

In the 8-chromosome rye the seven chromosomes of normal rye could be identified and in addition a small chromosome with an oval head attached to the proximal end of a long arm.

At the first division the behaviour of the extra bivalent was irregular, resulting in pollen grains with 7-9 chromosomes. The possible origin of the extra chromosome is discussed; the measurements made on its length do not support Gotoh's theory. No other theory is advanced.

687. LINNIK, G. N. 633.14:581.162.32:578.08  
(A new method of crossing rye.)  
Semenovodstvo (Seed Growing) 1934 : No. 1 : 24-25.

By cutting off the flower 3-3.5 mm. below the tip of the inner palea the stamens protrude when they reach full development but are not yet mature and so can be removed without damage to the flower. The flowers are cut on the first or second day after the emergence of the ear. The grain is gathered at the beginning of the stage of wax ripeness and there is therefore no risk of loss of grain by shedding.

688. LÖHLEIN, H. 633.14.00.14  
Dreijährige vergleichende Untersuchungen an 27 Roggensorten. Ein Beitrag zur Sortenkunde des Winterroggens. (Three-year comparative investigations on 27 rye varieties. A contribution to the knowledge of rye varieties.)  
Z. Zücht. 1934 : A 20 : 23-61.

Detailed data are given of the individual behaviour of a large number of characters in all 27 varieties over a three year period.

689. BĒRZIŅŠ, E. 633.14.0014(47.4)  
 Rudzu sēlēkcija un šķirnes. (**Breeding and varieties.**)  
 Lauksaimn. Mēnešr. 1932 : No. 2 : 81-94.

A new selected variety Stende rye with marked resistance to cold and general hardiness is described. It proved superior in grain yield to the land rye and Svalōf's Pansar and also surpassed the latter yield in straw. The new type is not sufficiently resistant to lodging. On a five year average the 1,000 corn weight for Stende's rye was 30.0 g. as compared with 30.1 gr. for Pansar rye and 24.1 g. for the land rye.

Results of variety trials of other Latvian varieties are mentioned.

## MAIZE 633.15

690. TAPLEY, W. T., ENZIE, W. D. and ESELTINE, G. P. van 633.15(74.7)  
**The vegetables of New York. Vol. I, Part III : Sweet corn.**  
 Rep. N.Y. St. Agric. Exp. Sta. 1934 : Pp. 111.

A composite publication by various authors containing chapters on the history of maize and botanical characteristics of this plant and its allies, followed by descriptions of varieties, mainly *Zea mays rugosa* Bonaf., with twenty-four full page photographs of types of cob in the white and yellow forms.

An extensive bibliography and index complete the volume.

691. HÉDIN, L. 633.15:575:577.81  
 Héritéité d'un maïs anormal. (**Inheritance in an abnormal specimen of maize.**)  
 C.R. Acad. Sci. Paris 1934 : 199 : 1062-64.

A study of the inheritance of the monoecious condition and certain morphological anomalies. No clear cut results emerged and the observations are not regarded as sufficient to demonstrate the hereditary nature of the anomalies in question.

692. EYSTER, W. H. 633.15:575.1(016)  
**Genetics of *Zea mays*.**  
 Bibliogr. Genet. 1934 : 11 : 187-392.

A comprehensive bibliographical monograph on maize genetics, including origin, general biological characteristics, technique of cultivation for experimental purposes, technique of pollination, a review of the genetics of the various characters in turn, an alphabetical list of the genes and their symbols, discussions of linkage and chromosome studies, a list of 536 references, an index and thirty pages of admirable illustrations.

693. LINDSTROM, E. W. 633.15:575.125  
**Experiments on hybrid vigour in maize.**  
 Amer. Nat. 1935 : 69 : p. 68. (Abst.)

A biometric analysis of the  $F_1$  and  $F_2$  from crosses of inbred lines of maize, dealing with ear weights and some of its components such as ear length and diameter and number of kernel rows.

The  $F_2$  curves for individual ear weights were not markedly skew but the constituent parts of ear weight did exhibit great skewness. Both ear and length diameter gave positive skewness, indicating dominance of large size, whereas number of row curves shewed negative skewness. The balance between these positive and negative trends was reflected in the decreased skewness of the ear weights. Multiple correlation studies confirmed these relationships. Hence the absence of skewness is not an indication of lack of dominance in size (weight) genes.

Decapitation of young hybrid plants shewed that the hybrids subsequently overtook the control parental lines in growth, thus effectively demonstrating their faster rate of growth and refuting Ashby's theory of heterosis.

694. ANDERSON, E. G. 633.15:576.356.2  
**Chromosomal interchanges in maize.**  
 Genetics 1935 : 20 : 70-83.

A table is given summarizing the data from diakinesis of 64 new interchanges obtained from mature seed treated with X-rays and identified by means of crosses with a series of tester stocks each homozygous for a known interchange.

All the known interchanges are also catalogued with references. A comparison of the frequencies of interchanges after X-ray treatment in the different chromosomes shewed that the frequencies are approximately proportional to the relative lengths of the chromosomes.

In marked contrast to the results obtained from *Drosophila* all the interchanges tested are viable in the homozygous condition indicating that the elimination for chromosome unbalance is much more severe in the haploid gametophyte than in the diploid sporophyte.

695. ANDERSON, E. G. and CLOKEY, I. W. 633.15:576.356.2  
**Chromosomes involved in a series of interchanges in maize.**  
 Amer. Nat. 1934 : 68 : 440-45.

A description of tests made to obtain chromosomal interchanges for further study and to isolate tester stocks for use in identifying chromosomes in a series of interchanges under investigation.

The material used was X-rayed seed ; and the tests were made by crossing plants containing new interchanges with plants containing interchanges already known and examining the configurations at diakinesis in the  $F_1$  sporocytes.

696. BRINK, R. A. and COOPER, D. C. 633.15:576.356.2  
**A proof that crossing over involves an exchange of segments between homologous chromosomes.**  
 Genetics 1935 : 20 : 22-35.

The material used was a strain of maize homozygous for two reciprocal translocations involving opposite ends of chromosome 1 crossed with normal maize and a study was made of the configurations in the hybrids.

An analysis of 211 back-crossed hybrids shewed that in all but two doubtful cases the expected configurations were found and provides definite proof of Morgan's hypothesis that crossing-over involves an exchange of parts between homologous chromosomes.

697. 633.15:576.356.2  
 STADLER, L. J. 633.15:575.116.12  
**Genetic behaviour of a haplo-viable internal deficiency in maize.**  
 Amer. Nat. 1935 : 69 : 80-81. (Abst.)

X-ray treatment of mature pollen resulted in this deficiency *Df* 5<sub>1</sub>, involving a short internal segment of the longer arm of chromosome 5. Heterozygotes for the deficiency equal their non-deficient sibs in growth but half their pollen is reduced in size, incompletely filled and rarely germinates. The deficiency is not transmitted through the pollen.

The deficiency includes the locus of *V<sub>3</sub>* but not the neighbouring *Bm<sub>1</sub>*, *Bt* or *Bv* loci.

The frequency of crossing-over is greatly reduced in heterozygous deficient plants, not only in the *Bm-Bv* region which includes the deficiency but also in the adjacent *Br-Pr* region.

698. 633.15:577.81:575.11  
 JONES, D. F. 633.15:577.81:575.172  
**Unisexual maize plants and their bearing on sex differentiation in other plants and in animals.**  
 Genetics 1934 : 19 : 552-67.

Among the genes affecting the floral expression in maize, tassel seed, anther ear, etc. shew a definite tendency to promote the development of flowers of one sex and to suppress those of the other, i.e. there are specific sex genes in maize. Similar effects upon the floral expression of sex may be produced by environmental influences and some strains tend to respond by such aberrations more readily than others. Moreover, the evidence of other workers on plants and

animals demonstrating the variation in sexual expression in response to environment does not, in the writer's opinion, preclude some hereditary mechanism for controlling the sex ratio. The genetic factors in question are supposed to operate in some way to determine the points on the physiological gradient from ♀-ness to ♂-ness (inherent in the maize plant and in both ♀ and ♂ inflorescences) where the development of the flowers of different sexes begins. Though in such a complex of interacting forces the effect of these factors is not complete, in general they determine the balance of control so that the effect of one or other allele directs development in one direction or the other. In the normal monoecious maize plant a change from the functionally carpellate to functionally staminate flowers represents a suppression or stimulation of one or other type and may be produced by genes or environment. Sex reversal in many unisexual plants and animals which are basically bisexual represents a similar mechanism.

The origin of dioecious maize from a cross between functionally pistillate (tassel seed—2, *ts<sub>2</sub>*) and staminate (silkleless, *sk*) individuals is further described. (Cf. also "Plant Breeding Abstracts," Vol. I, Abst. 357, 530; Vol. III, Abst. 420 and Vol. IV, Abst. 695) and the breeding ratios have shown that the ♀ plants are homozygous for both *ts<sub>2</sub>* and *sk* and are monogametic while the ♂ plants are *sk sk Ts<sub>2</sub> ts<sub>2</sub>* and are digametic; this maintains the sex ratio.

A study of variation and sex intergradation in the pistillate plants seemed to indicate genetic control of some kind. The silkless gene was usually clear cut in its expression.

In this dioecious material no differences were visible in the ♂ and ♀ determining chromosomes.

The silkless and tassel seed genes are regarded as specifically ♂ and ♀ promoting respectively.

The relation of dioecious maize to sex in other organisms is briefly considered.

699. RUGUZOV, A. M. and SIBILEV, A. I. 633.15:577.845  
**(On the question of the "transformation" of the species *Zea mays* L.)**  
 Bull. Appl. Bot. Leningrad 1934: Ser.A(11): 119–20.

Seeds from the occasional cobs which develop in place of the silks in maize were sown in 1932. Though the germinating capacity of the seeds was low the plants obtained grew normally. Their silks however contained female flowers at the base and male flowers above. The authors therefore consider the character to be inheritable and capable of fixing by inbreeding and that a form valuable for mechanized harvesting, bearing its cobs high up the stem, could so be produced. Some of the plants here obtained were earlier in maturity and are considered valuable also for that reason.

700. KRUG, C. A. 633.15:581.162.3  
 Pollenisação controllada no milho. (**Controlled pollination in maize.**)  
 Rev. Agric. S. Paulo 1934: 9: 42–44.

A practical description of the method of pollination of maize with the object of maintaining the purity of the lines.

701. BURNHAM, C. R. 633.15:581.331.2:581.162.51  
 633.15:575.11  
**Abnormal genetic ratios in chromosome 1 of maize associated with pollen abortion.**  
 Amer. Nat. 1935: 69: p. 60. (Abst.)

In an inbred line plants with an average of about 50 per cent pollen abortion shewed no aborted ovules and the pollen sterility was transmitted only when such plants were used as females in the cross. Evidence has been obtained indicating that the "factor" causing aborted pollen lies in the chromosome 1 and between *P* and *br* (brachytic), shewing 34.5 per cent recombination with *P* (coloured pericarp), 31.9 per cent with *br* and independence with *bm<sub>2</sub>* at the other end of the linkage group.

No abnormality in any of the chromosomes has yet been discovered cytologically; but a very short and not easily detected deficiency may be present.

702. EYSTER, W. H. 633.15:581.483:575.11  
 Gametophytic genes in a high waxy strain of maize. 633.15:575.11:581.331.2  
 Amer. Nat. 1935 : 69 : 62-63. (Abst.)

Pedigree maize plants heterozygous for waxy endosperm produced  $F_2$  kernel progenies in which waxy kernels varied from 5-48 per cent and also back-cross progenies in which the percentage was 39-90. Reciprocal crosses between heterozygous and homozygous waxy plants shewed that the deficiency of starchy and excess of waxy kernels (or the reverse) was caused by genes affecting the microspores but never the megaspores.

Some of the genes rendering the ♂ gametophyte non-functional are located in chromosome 9 and are responsible for the observed deviations from the expected numbers of waxy and non-waxy kernels.

703. RHOADES, M. M. 633.15:581.483:575.11.061.6  
 A new aleurone colour in maize.  
 Amer. Nat. 1935 : 69 : 74-75. (Abst.)

In an inbred strain of Black Mexican sweet corn a selfed ear segregated for aleurone colour into 12 purple : 3 dotted : 1 colourless seeds. The dotted aleurone class is attributed to the interaction of a new dominant factor *Dt* with recessive  $a_1$ . Seeds that are  $a_1A_2CRDt$  have dotted aleurone while those that are  $a_1A_2CRdt$  have colourless aleurone. Since Black Mexican strains do not carry *Dt* and are homozygous for aleurone colour it is probable that the mutations of  $A_1$  to  $a_1$  and  $dt$  to *Dt* occurred in the same cell. *Dt* produces no colour with  $a_2c$  or  $r$  and is not linked with  $a_1$ ,  $a_2$ ,  $c$ ,  $r$ , or  $su$ .

Ratios are cited which suggest either that the dosage of  $a_1$  affects the number of dots on the seed or else that  $a_1p$  has an inhibitory effect proportional to the dosage of  $a_1p$ .

#### BARLEY 633.16

704. TSCHERMAK-SEYSENEGG, E. 633.16:575(43)  
 Neue Gerstenzüchtungen der Pflanzenzuchtstation in Gross-Enzersdorf.  
 (New barley strains from the Plant Breeding Station at Gross-Enzersdorf.)  
 Landeskultur 1934 : 1 : 151-53.

Tschermak has bred for brewing purposes Tschermak's 2-rowed Winter Barley I and II, two early, winterhardy, fine glumed barleys, resistant to lodging and with a low protein content and light coloured or pure white endosperm. The second is scarcely distinguishable from a spring barley. Owing to their partial origin from spring barleys they belong to the so-called alternative barleys.

This work is being continued. According to Tschermak it is possible to breed types resistant to lodging by crossing *nulans* with *erectum* forms without affecting the fineness of the glumes. It is true, however, that the practical man has little confidence in these productions, fearing confusion with *erectum* types.

For some years the author has been engaged in the production of naked barleys for brewing and fodder purposes. Results with awnless barleys have not been promising so far. He is also working on the production of hybridization of barleys with short plump grains that have been in demand for some time.

Some of the author's older productions are also mentioned.

A. B.

705. TEDIN, O. 633.16:575.061.6:581.48  
 Blåfärgning av maltkorn. (Blue coloration of malting barley.)  
 Sverig. Utsädesfören. Tidskr. 1934 : 44 : 417-22.

A blue coloration of the aleurone layer has been known in six-rowed barleys but has not been previously reported in malting barley.

Considerable differences were found in the occurrence of blue grains among different varieties, some shewing no blue grain and others a considerable percentage.

The coloration is a phenomenon of premature ripening and the differences between varieties depend partly on their susceptibility to climatic conditions in this respect and partly on the possession of genetical factors which determine the blue colour.

706. KUCKUCK, H. 633.16:575.127.2  
 Artkreuzungen bei Gerste. (Vorläufige Mitteilung.) [**Species crosses in barley. (Preliminary contribution.)**]  
 Züchter 1934 : 6 : 270-73.

*Hordeum sativum* ♀ (n = 7) x *H. bulbosum* ♂ (n = 14) set a varying amount of grain in different years. No grain was set in the reciprocal cross. The grain however, was much shrivelled and non-viable though a certain amount of development occurred when the embryos were dissected out and grown in sugar solution.

Finally, one F<sub>1</sub> plant was obtained from a shrivelled grain of a cross with Karsten's two-rowed winter barley as the female form. It resembled very closely *H. bulbosum* but the ears were much smaller, the bulbous swelling at the base of the culms was absent and the root tips shewed 21 chromosomes. It was both male and female sterile and no back-crosses succeeded.

The use of winter forms of *H. sativa* gave a definitely greater set of grain and it is clear that the female parent has an inhibiting action on the developing grains.

707. IMAI, Y. 633.16:575.242.061:633:581.174  
**Variation in the rate of recurring plastid mutations in *Hordeum vulgare* caused by differences in the sowing times.**  
 Genetics 1935 : 20 : 36-41.

The result of sowing at intervals of ten days a pure line of variegated barley was considerable variation in the frequency of occurrence of albino seedlings. The variegation concerned is due to an exo-mutation of the plastids from green to white and the character behaves as a simple recessive; it is therefore assumed that external conditions such as temperature may influence the gene concerned.

708. BORODIN, D. N. 633.16:581.143.26.03  
**Yarovization of winter barleys.**  
 Amer. J. Bot. 1934 : 21 : p. 708.

Fifty strains of barleys of four botanical species including forms from India and the Himalayas were subjected to vernalization, four different formulae (i.e. predetermined combinations of moisture, time and temperature) being used. The response of such pre-treatment is specific for any one strain.

Out of the 50 strains, seven gave a typical winter type response (i.e. full heading in the experiment and grass-cluster in the control), ten a winter-spring type response by acceleration of heading and ripening, and two a spring-winter type response by slight acceleration of heading. Thirteen strains failed to respond. Nine varieties produced heads in the experiment and control plants, i.e. a spring type response.

## MILLETS AND SORGHUMS 633.17

709. SIEGLINGER, J. B., SWANSON, A. F. and MARTIN, J. H. 633.174:575.11:581.46  
**Inheritance of awn development in sorghums.**  
 J. Agric. Res. 1934 : 49 : 663-68.

Crosses were made between varieties of sorghums possessing different degrees of awnness. The results in the F<sub>2</sub> and F<sub>3</sub> shewed that in crosses between awnless x strong awn, dominance of the awnless character was nearly complete in the F<sub>2</sub> and segregation shewed a 3 : 1 ratio.

In the cross tip awn x strong, the strong awn behaved as a simple but partially dominant character and in the awnless x tip awn cross the awnless character was almost completely dominant with a monofactorial ratio. In explanation of the inheritance of awn development in sorghums three multiple allelomorphs are suggested, *AA* (awnless), *aa* (strong awn) and *atat* (tip awn).

710. MIYAZAWA, B. 633.18:575.242  
**(Studies on mutations in rice.)**  
 Bull. Miyazaki Coll. Agric. For. 1935 : No. 7 : Pp. 110.

A genetical study of mutations of rice has been made by the author for some years and a large number of mutations is here described. These are grouped under chlorophyll deficient, sterile and semi-sterile, the last group containing the largest number of examples, which is further subdivided into semi-sterility caused by abnormal structure of the floral organs, semi-sterility of plants with morphologically perfect sexual organs (factor mutations) and semi-sterility and fertility accompanying an abnormal plant character.

The English summary gives brief descriptions of the various types and their genetical behaviour.

711. IMAI, Y. 633.18:575.242.061.634  
**An unstable line of *Oryza sativa* that throws out albinos.**  
 Jap. J. Genet. 1934 : 10 : 89-90.

A description of a line which frequently segregates albinos either as simple recessives in some lines or sporadically in others. This difference in the frequency of albinotic plants may be due to the different results arising from mutation at or before gametogenesis or in somatic divisions. Possible causes of variegated seedlings in the line in question are also mentioned.

712. HOROVITZ, S. and POGLIAGA, H. 633.18 *O. subulata*:576.312.35  
 Número de cromosomas de *Oryza subulata* Nees. (**Chromosome number in *O. subulata* Nees.**)  
 Rev. Argent. Agron. B. Aires 1934 : 1 : 230-31.

The South American wild rice *O. subulata* whose area extends over Brazil, Paraguay, Chaco, Argentina and Uruguay has been examined and shewn also, like *O. sativa*, to possess 12 pairs of chromosomes in the pollen mother cells, where meiosis was entirely regular.

713. ADAIR, C. R. 633.18:581.162.3  
**Studies in blooming in rice.**  
 J. Amer. Soc. Agron. 1934 : 26 : 965-73.

The number of days required for all the flowers of a panicle to bloom, the number of flowers that bloomed each hour on single panicles and the effect of some climatic conditions were studied in five varieties of rice.

The rate and hour of blooming was found to be definitely affected by certain climatic conditions, especially by the temperature and the intensity of the sunlight. Humidity had a much less marked effect.

In all the varieties studied, the pollen was shed just before or at the time the flowers opened.

714. GUSTCHIN, G. G. 633.18:582  
 Saggio di classificazione botanica dei risi coltivati *Oryza sativa* L. (**An attempted botanical classification of the cultivated forms of rice, *O. sativa* L.**)  
 G. Risicolt. 1934 : 24 : 261-67.

Completion of the paper already referred to in " Plant Breeding Abstracts " Vol. V, Abst. 386.

715. 633.18-1.547.1  
 633.18:576.312.35  
 633.18:581.162.32  
 MORINAGA, T.  
**(Some observations on *Oryza minuta* Presl.)**  
 Jap. J. Genet. 1934 : 10 : 91-92.

When compared with *O. sativa*, *O. minuta* has some distinctive features, besides the difference in outward form. In December 1933 some seeds of *O. minuta* were sown in a germinator at a temperature suitable for *O. sativa* ; but germination was slow and after a little over a month only some of the seeds germinated. After this, the seeds were kept in a hothouse. They germinated

freely at intervals and after a few months all had germinated. Seeds of *O. minuta* appear to ripen about a fortnight after flowering. Since at flowering the stamens are entirely exerted it can be deduced that *O. minuta* cross-pollinates as a rule. The number of chromosomes is 48 in the root; the reduction division is normal; 24 bivalent chromosomes are formed. Fertility is fairly low. (Figs. 2 and 3).

Hybrids proved possible between *O. minuta* and *O. sativa*, the cross being particularly easy when *O. sativa* is the ♀ parent. These hybrids are worth studying.

716. SHEN, T. H. and SHEN, H. N. 633.18:2.7-1.521.6

**Breeding rice in China for resistance to the stem borer.**

Bull. Coll. Agric. For. Nanking 1934 : No. 20(N.S.) Pp. 12.

The methods and results are presented of varietal tests with rice for resistance to the two species of stem borer *Schoenobius incertellus* Wlk. and *Chilo simplex* Bult. over a five-year period. Of the varieties tested two strains 1-3-86 and Ningpo Sen shewed marked resistance.

**LEGUMINOUS FORAGE PLANTS 633.3**

717. HACKBARTH, J. and SENGBUSCH, R. v. 633.367:581.192.6:575.11

Die Vererbung der Alkaloidfreiheit bei *Lupinus luteus* und *Lupinus angustifolius*. (The inheritance of absence of alkaloid in *L. luteus* and *L. angustifolius*).

Züchter 1934 : 6 : 249-55.

The first stage in the breeding of alkaloid-free lupins, the discovery of the existence of such strains and their multiplication has already been described (see "Plant Breeding Abstracts," Vol. IV, Abst. 1003). For the next step, the creation of satisfactory varieties of sweet lupins by systematic breeding, a knowledge of the inheritance of the character concerned is necessary.

The technique for the emasculation and hybridization of the flowers is described.

Crosses between sweet lupins of either *L. luteus* or *L. angustifolius* and normal bitter lupin plants (which were always used as the pollen parent) shewed that absence of alkaloid behaves as a simple recessive factor.

Crosses of sweet lupins among themselves shewed that in *L. luteus* three genetically different factors exist and two in *L. angustifolius*.

The importance of these results for the breeding and cultivation of sweet lupins is discussed.

**ROOTS AND TUBERS 633.4**

718. COLIN, H. and PICAULT, M. 633.41 B. *patellaris*

L'espèce spontanée *Beta patellaris* Moq.-Tond. (The wild species *B. Patellaris* Moq.-Tond.).

Publ. Inst. Belge Amélior. Better. 1934 : 2 : No. 4 : Pp. 8.

A botanical and histological description of this wild species common in the region of Agadir. Seeds obtained from Algeria sown in Paris yielded 4 embryos from 20 glomerules. Cytological investigations of the roots and stems shewed considerable differences as compared with *B. maritima* and other cultivated varieties.

Crosses of *B. patellaris* with sugar beet and mangel varieties failed. The only wild species whose hybrids appear to be of possible practical interest are *B. vulgaris* and *B. Cicla*.

719. BERG, K. H. 633.41:576.356.5

Über Polyploidie in der Gattung *Beta* und bei den Kulturpflanzen überhaupt. (Polyploidy in the genus *Beta* and in cultivated plants generally.)

Züchter 1935 : 7 : 16-19.

All cultivated varieties of *B. vulgaris* have a haploid number of 9 chromosomes. *B. trigyna* has been shewn to have  $n = 27$  and the author has found  $2n = 36$  in *B. lomatosogona*. This is the first clear case of polyploidy within the *Chenopodiaceae* though *Chenopodium* and *Atriplex* both shew species with 9 and 18 haploid chromosomes.

The significance of the occurrence of polyploidy in cultivated plants is briefly discussed.

720. SUNDELIN, G. 633.41:581.162.5:575  
 Självfertilitet och självsterilitet hos *Beta*. (Self-fertility and self-sterility in *Beta*.)  
 Sverig. Utsädesfören. Tidskr. 1934 : 44 : 329-52, 363-85.

The work recorded was begun in 1919 and continued till 1930. The material used has been mostly plants from a mass selected population of sugar beets, later tests were made on fodder beets and on some plants of *B. patellaris*.

*Beta* is normally wind-pollinated though pollination by insects is not excluded.

As a method of isolation, the use of parchment bags has been found effective.

It is shewn that the climatic conditions have an important influence on the results of the isolation experiments and that the temperature and moisture within the bags are of definite significance. The isolation experiments shewed clearly the existence of true self-sterility.

The increased self-fertility as the result of inbreeding is assumed to be partly the effect of selection and partly due to the presence of clear genetical differences in self-fertility.

The fall in the fertility of plants selfed for several generations when compared with that of the normal population is attributed to inbreeding.

721. ZOSIMOVICH, V. P. 633.41-1.524  
 (Wild beet, its value in the breeding and genetics of sugar beet.)  
 Semenovodstvo (Seed Growing) 1934 : No. 1 : 19-22.

The present sugar beets are all derived from a narrow circle of original forms and are very lacking in variety compared with the great range of diversity in the wild and cultivated beets. The possibilities of the pure line and inbreeding methods are more or less exhausted. Even crossing with the cultivated and semi-cultivated beets does not give the same variety of characters offered by the wild beets. A study has been made therefore of the wild species and different geographical races obtained by the expeditions to Transcaucasia and elsewhere. It has been shewn that the wild beets grow in a variety of ecological conditions in and near the Mediterranean countries. The species arrange themselves naturally into three groups according to ecological conditions and behaviour in crossing, namely the eastern groups, *Beta lomatogona*, *B. trigyna* and *B. macrorhiza* in Transcaucasia, Asia Minor and the Balkans; the central group consisting mainly of the highly polymorphic species *B. vulgaris*, and the western group *B. patellaris*, *B. procumbans* and *B. Webbiana*.

The species of the first group are tolerant of frost and extremely unfavourable conditions of growth and are perennials, never flowering until the second or third year. They possess extremely large roots, weighing up to 10 kg., with a sugar content of 12-16 per cent. The species *B. lomatogona* with one-seeded capsules and almost cleistogamous flowers is also of interest.

*B. lomatogona* and *B. macrorhiza* have been shewn to have 18 somatic chromosomes, whilst *B. trigyna* represents a case of natural polyploidy, the Caucasian forms having 36 and the Crimean forms 54. Other forms with unbalanced chromosome numbers occur and this species is thought to be still in the process of formation.

The second group is widely extended in the coastal regions and contains a number of different ecological sub-groups. The Mediterranean forms are drought resistant and annuals. A great variety of forms has been found in the arid steppes of Russia, in salt steppes and as a weed in cotton fields. Some are very early in maturity. Other interesting forms are the dwarf early African species *B. macrocarpa* and the African *B. patula* with lanceolate leaves, and the central European *B. maritima* on account of its biennial habit and the resistance of some of its forms to *Cercospora* and to frost. All these beets have 18 chromosomes and easily cross with the cultivated forms.

The third group contains both annual and biennial forms. Their somatic chromosome number is also 18.

In view of the many valuable characters occurring in these wild beets extensive hybridization work will be carried out with them in spite of certain difficulties that this entails.

722. ONNO, M. 633.42  
Die Wildformen aus dem Verwandtschaftskreis "*Brassica oleracea* L." (The wild forms of the taxonomic group *B. oleracea* L.)  
Österr. Bot. Z. 1933 : 82 : 309-34.

Descriptions are given of a large number of wild species, many of which have probably given rise to the various forms of cultivated *Brassica* of to-day.

723. 633.491 Kalev  
633.491 Kungla  
AAMISEPP, J. 633.491:575(47.4)  
Jõgeva kartulisordid välismaa katsejaamade andmeil. (Comparative trials in foreign countries with the new potato varieties "Kalev" and "Kungla" from the Plant Breeding Station, Jõgeva.)  
Agronomiia 1934 : No. 5 : 192-96.

Comparative tests of the two varieties were made in 1932 and 1933 in Latvia, Finland and the U.S.S.R. Both proved superior in yield to the standard types Deodara and Majestic and took first place among 101 foreign varieties tested in Kalitino (U.S.S.R.).

The two new varieties were however below the standard Deodara in average starch content (see "Plant Breeding Abstracts," Vol. IV, Abst. 1012.)

724. SNELL, K. 633.491(43)  
Untersuchungsergebnisse der Kartoffelsorten-Registerkommission von ihrer Gründung bis zum Jahre 1933 einschliesslich. (The results of the investigations of the commission for the registration of potato varieties from its inception to the year 1933 inclusive.)  
Z. Zücht. 1934 : A 20 : 72-103.

The commission since 1925 has tested all new German varieties or new selections put on the market and if these are really new and not old varieties under new names they are included in the register.

This register is here printed giving the varietal name in alphabetical order followed by the name of the grower and a very short description of the main characteristics of the plant. A list of the growers with their addresses is also given.

725. 633.491(47.4)  
633.491.0014(47.4)  
KÄSEBIER, A. and JAKOBSON, A.  
Kartuli sordiküsimus Põhja-Eestis. 9 aastase sordivõrdluskatse tulemusi Riigi Põllutöökatsejaamas, Kuusikul 1925-1933. (The question of potato varieties in North Estonia. Nine years of variety tests at the State's Agricultural Experiment Station, Kuusiku, from 1925-1933.)  
Agronomiia 1934 : No. 4 : 127-36.

During the nine-year period 1925-1933 the best foreign varieties have been compared with some new Estonian varieties (including Kungla and Kalev) on typical North-Estonian soil at the State Experimental Station. Data about the best varieties and their distribution are given.

Every year the yield and size of the tubers, and the percentage and yield of starch have been determined, as was also the taste of the tubers in the course of five years' trials. The boiling properties, mealiness, and the colour of the flesh have been investigated and also the percentage protein content in trials during two years. For completeness, each variety has been observed for *Phytophthora*, resistance to scab and hardness as regards the conditions of growth.

726. SCHICK, R. 633.491:575  
Untersuchungen über den Wert des *Solanum andigenum* für die Kartoffelzüchtung. (Investigations on the value of *S. andigenum* for potato breeding.)  
Züchter 1934 : 6 : 273-80.

*S. andigenum* Juz. et Buk. and *S. tuberosum* both with 48 somatic chromosomes enter into the parentage of the cultivated European potato varieties. One of the most important differences

between the two is the fact that while *S. tuberosum* includes only long-day forms, the forms of *S. andigenum* are preponderantly short-day and bound up with this are a number of characters undesirable in a cultivated potato.

Crosses were made between various clones of *S. andigenum* and various European varieties. The results of observation on the  $F_2$  selfed or intercrossed shewed that the short-day reaction and its attendant characteristics are determined by such a large number of dominant and intermediate genes that the chances of finding plants in the  $F_2$  without these characters is remote.

Of three other methods by which *S. andigenum* might be used for breeding, (1) back-crossing the  $F_1$  with European varieties, (2) back-crossing the best  $F_2$  clones with European varieties or (3) testing a large number of  $F_1$  plants from as many combinations as possible of *S. andigenum* with European varieties to determine whether the marked short-day reaction occurs in every case, the author considers the last to be the most likely to give the quickest results.

Therefore in 1933, 49 combinations were made between 17 clones of *S. andigenum* and 11 European varieties.

Though the majority of the  $F_1$  again shewed the dominance of the short-day reaction in one case in particular, where the form D 901 from Ecuador was used, no marked short-day characters were inherited. The result suggests that different genetical factors determine the short day reaction. In any case, the  $F_1$  in question provides a valuable starting point for the breeding of strains which will combine other desirable qualities.

727. SIKSTEL, D. A. 633.491:575:578.082  
**(Growing two crops of potato per year in Central Asia—the method of desiccation of tubers.)**  
 Bull. Appl. Bot. Leningrad 1934 : Ser. A(11) : 199–204.

Tubers were picked from the variety Nimrang at intervals of 5–10 days from the time of flowering onwards. The tubers were allowed to dry (a) in the sun, at a temperature of up to 57°C., (b) in the shade, at a maximum temperature of 37°C. and (c) in the thermostat at 35°C. The water content of the tubers was determined daily and every other day some of the tubers were sown in moist sand.

The sun-dried tubers germinated first but were greatly damaged. The results shewed that germination takes place only when the tubers have lost 20 per cent of their water and that this should be removed gradually, over a period of 22–28 days; hence the tubers dried in the shade were the most successful. The best temperatures for germination proved to be 25°, 27°, and 30°C. Control tubers undried but sown at the same time germinated hardly at all, which demonstrates that desiccation is the main factor in breaking the resting stage of the tubers. The experiments were performed in Central Asia but the possibility of growing two generations of tubers a year is thought to be applicable in other places and attention is called to the value of the method in potato breeding.

728. TIKHONOV, P. and DEMIDOVICH, A. 633.491:575:631.421  
**(Acceleration of potato breeding.)**  
 Semenovodstvo (Seed Growing) 1934 : No. 2 : 56–59.

Tests of five potato varieties indicated that for reliable comparisons it is sufficient to take fifty tubers of each variety to be tested, if the standard is grown between every 10–15 varieties. Thus as soon as fifty tubers are available of any new seedling it should be included in the preliminary variety tests. The following year it can be included in the proper variety tests, where it is recommended to use eight replications with twenty-five tubers each. In this way the work of testing and multiplication can be carried out concurrently and new improved strains made ready for distribution in the shortest possible time.

729. KRENKE, N. P., BELSKAJA, T. N. and 633.491:575:255:576.356.5  
 DUBROWITZKAJA, N. I.  
**[Experimental adventive shoots in the potato (*Solanum tuberosum* L.).]**

Timiriaseff Biol. Inst., Moscow, Phenogenetical Variability 1933 : 2 : 173–288.

In a discussion of the nature of the processes of regeneration it is shewn that plants differ in their type of growth, the majority of the higher plants are metameric, indefinite in the number

of organs and parts produced, and such plants regenerate by reproduction, i.e. by producing more organs or parts not necessarily at the position of the wound. Certain plants however are strictly limited in the number of parts they produce, and such plants are analogous to insects: on wounding they can only regenerate by "restitution," i.e. by replacing the broken organ or part at the exact position it originally occupied. The removal of all the axillary buds in the callus treatment destroys the metameric nature of a plant and forces it to regenerate by restitution.

Thus it is seen that success in regenerating shoots from a wound callus depends on a knowledge of the mode of growth of the plant under experiment and of the precise conditions which influence its regenerative processes in general. Experiments were made with various stimulating substances, including the expressed sap of the young growing shoots, applied to the callus of cut potato tubers. The results were negative and attention was turned to the action of bacteria and various fungal infections, especially of *Bacterium tumefaciens*. The work of earlier authors on these lines is discussed.

By infecting the cross-sectional cut of the young shoots of various potato varieties with *Bacterium tumefaciens*, adventive shoots were developed from the vast majority of the tumours formed, in some varieties from 100 per cent of them. A certain amount of shoot formation occurred also on uninfected cuts and another successful way was found to be to retain a tuber for a considerable length of time, continually removing the eyes as they develop; in this way endogenous adventive shoots were obtained in all varieties tried and they appeared invariably in the zone round about the eyes which had been removed, which increases the probability of cytological aberrations. The results of Asseyeva (see "Plant Breeding Abstracts," Vol. III, Abst. 88) were also confirmed, greater success being obtained by making incisions of the least possible depth. Adventive shoots were also obtained from roots and from the leaf petiole. In all 125 adventive shoots were obtained in the variety Jubel and 123 in Narodnij. The most successful method for their production was to cut the tuberous shoots formed by tubers in the light. The greatest number was obtained from the treatments with *Bacterium tumefaciens* and the young shoots gave better results than older ones.

All the cuttings obtained in the various different ways grew successfully when isolated and formed tubers in autumn. Cytological examinations were made of their roots, in some of which tetraploid cells ( $2n = 96$ ) were observed, both in the shoots derived from cut stems infected with the bacterium and those not so infected. The tetraploid cells are illustrated by drawings and photographs and are seen to be larger than adjacent diploid cells. The disposition of the tetraploid cells in some of the roots indicates that these are sectorial chimaeras, probably arising from a sectorially tetraploid shoot. From these it will be possible to produce tetraploid individuals, which are expected to have larger tubers and be more vigorous in growth, thus giving greater yields.

It is thought that the method of removing the eyes will also produce polyploid shoots but experiments on the further improvement of the method are in progress.

This is by no means the only method of obtaining chimaeras in the potato and reference is made to a number of cases of graft chimaeras in the potato obtained by earlier writers, followed by descriptions of those obtained by the authors by uniting both stolons and young tubers.

Full details are given of the organization of the work and of its cost and the methods, and results are described in detail by the two junior authoresses in their own words. The senior author states that the technique of producing polyploid shoots in the potato has been definitely mastered and the production of practical results only awaits the application of the work on an extensive scale.

730. DIEHL, R. 633.491:576.16  
 La détermination des variétés de pommes de terre au moyen des caractères  
 du tubercule et des germes. (The identification of potato varieties by  
 means of tuber and sprout characters.)  
 Sélectionneur 1934 : 3 : Fasc. 1. 23-48.

The characters of the tuber and sprout are examined with a view to their value for classification and a scheme based on the findings is proposed.

731. GREISENEGGER, I. K. and NEUDECKER, B. 633.491:581.471:576.16(43.6)  
Die Knollenform als Sortenmerkmal der Kartoffel. Ein Beitrag zur Sortenechtheitsbestimmung. (The shape of the tuber as a varietal character in potatoes. A contribution to the determination of the authenticity of plants of a given variety.)  
Landeskultur 1934 : 1 : 138-43.

The authors' aim is the utilization of the shape of the tuber as a new character for determining authenticity in completing the experiments in connexion with the registration of varieties; they pointed out the importance of this character in breeding work, drawing special attention to the rapidity with which this test can be carried out and its validity. They pointed out, however, that a consideration of tuber shape alone would not be valid. The method of measurement of shape, which is very simple, is briefly indicated. The experiments were carried out during five years and dealt with many different experimental varieties in climatically different regions throughout Austria and with numerous varieties and an enormous number of tubers (40,000 with 120,000 measurements). The experiments are still in progress but among the results already obtained is the fact that plants derived from seed direct from the breeder have longer tubers than the subsequent generations obtained from the same variety. The method has been already used in deciding legal cases. A. B.

732. POSTELT, R. 633.491-2.412.5-1.521.6:575(43)  
Krebsfester 'Industrie'-Ersatz? (A wart-immune substitute for 'Industrie'?)  
Dtsch. landw. Pr. 1934 : 61 : p. 40.

Yield figures are given for a number of new resistant potato varieties which are recommended on account of their flavour, which is said to be comparable with Industrie. The varieties Ostbote and Quitte are in the author's opinion especially good in quality.

733. SCHULTZ, E. S. et al. 633.491-2.8-1.521.6:575.11  
Resistance of potato to mosaic and other virus diseases.  
Phytopathology 1934 : 24 : 116-32.

The reaction of a number of potato varieties to streak, and of varieties and seedlings to latent and mild mosaic was studied and both highly resistant and susceptible plants were found in the last two types of disease.

The progeny of a cross between parents resistant to mild mosaic shewed transgressive segregation and the results, though inconclusive, indicate at least two cumulative factors. From this progeny the Katahdin potato has been selected which besides high resistance to mild mosaic, possesses valuable economic properties.

### FIBRES 633.5

734. ROCHETTE. 633.51:575.127.2  
Note sur le cotonnier variété hybride Karangani x Garroh Hills, dit, improprement, Karangani No. 5. (Note on the hybrid variety of cotton Karangani X Garroh Hills, wrongly called Karangani No. 5).  
Bull. Ass. Cotonn. Colon. 1934 : 32 : 8-12.

The variety in question—a hybrid between *Gossypium indicum*, Karangani A 10, and *G. cernuum*, Garroh Hills—is described, with remarks on its yielding capacity. It is relatively resistant to fungous diseases. Figures are given regarding the length, fineness and tensile strength of the fibres. The fibres are short and thick but uniform; the vegetative characters are more variable.

735. SOYER, L. 633.51:575.42(49.3)  
Note sur quelques progrès réalisés dans les méthodes de sélection du cotonnier au Congo Belge. (Note on the progress achieved in the methods of selection of cotton in the Belgian Congo.)  
Journées Agron. Colon. Gembloux 1933 : 167-73.

The methods employed for mass and pedigree selection are described.

736. BEASLEY, J. O. 633.51:581.162.3:578.08  
**Soda straws in hybridizing cotton.**  
 J. Hered. 1934 : 25 : p. 502.

The use of lint cotton wrapped round the base of the stigma under the straw is recommended as an easier and more satisfactory method of fastening the straw covering than a paper clip or string. (Cf. "Plant Breeding Abstracts," Vol. V, Abst. 409.)

737. CUVELIER, L. 633.51-1.521.1:575.42  
 Sélection massale des graines de coton. (**Mass selection of cotton seed.**)  
 Journées Agron. Colon. Gembloux 1933 : 147-58.

The procedure followed at the Gandajika Station for the mass selection of cotton seed with the object of maintaining the purity of the stock is described.

738. BARDUZZI, T. B. 633.51-2.484-1.521.6:578.081  
 Une nouvelle méthode pour la détermination rapide des individus attequés par le "Wilt" du Cottonnier : la "Méthode de la Feuille" ou "Cotton wilt leaf Index." (**A new method for the rapid determination of individuals attacked by cotton wilt : the "cotton wilt leaf index."**)  
 Journées Agron. Colon. Gembloux 1933 : 439-43.

The method described consists in breaking off at the point of insertion 1-3 leaves attached to the main stem and an examination of the broken surface of the petiole will shew whether the plants are infected with *Fusarium*.

739. POPE, O. A. 633.51:677.21:578.081  
**The calculation of certain fiber length constants in cotton.**  
 J. Amer. Soc. Agron. 1933 : 25 : 740-56.

Staple length is unsatisfactory for comparison of the small differences with which breeders deal—an alternative is suggested.

740. BĒRZINŠ, E. 633.52:575.42(47.4)  
 Sasniegumi linu šķirņu sēlēcijā. (**Results of flax selection.**)  
 Lauksaimn. Mēnešr. 1934 : No. 10 : 467-500.

At the seed selection station at Stende the different land varieties of flax have been classified according to length of stem and type of seed capsule. Selection work and identification of a number of characteristics e.g. yield of seed and fibre, length of stem, branching habit, etc., have also been combined with cultural experiments with selected lines and a land form, in order to determine the degree to which certain quantitative characters which could serve as a basis for selection are inherited.

In three year trials of local and foreign varieties the Stende variety Balva proved superior in yield of long fibre and total fibre.

Tests at the local experiment stations confirmed the results obtained at Stende.

741. INOUE, C. 633.52:576.312.35  
 633.52:576.354.4  
 (**Meiosis in pollen mother cells of *Linum usitatissimum*.**)  
 Proc. Crop. Sci. Soc. Japan 1934 : 6 : 280-87.

The phases of meiosis are outlined, the behaviour and significance of the prochromosomes, the nucleoli and the spireme receiving special attention. The nucleolus is regarded as containing the chromosome material.

The haploid number of chromosomes in *L. usitatissimum* is 15.

742. BĒRZINŠ, E. 633.52:581.19(47.4)  
 633.52:677.2:575-181.12  
**Latvijas vietējās linu šķirnes un to audzēšanas rajoni. (Latvia's local flax varieties and their regions of cultivation.)**  
 Lauksaimn. Mēnešr. 1934 : No. 11 : 517-48.

The geographical distribution of the long and short stemmed types of flax in Latvia is described and the hereditary nature of stem length is emphasised.

743. **FLEISCHMANN, R.** 633.522:575  
 Beiträge zur Hanfzüchtung. (Notes on hemp breeding.)  
 Faserforschung. 1934 : 11 : 156-61.

The author points out that in hemp just as in flax there is a continuous series of forms from the typical northern type, with short stems and copious production of large seeds in short dense female inflorescences, to the southern type from the Mediterranean, India and China, with long stems, long branched female inflorescences, bearing reduced quantities of small seeds. These represent different biological types and in breeding it is of great importance which type is selected. The most successful type will depend upon the growth conditions of the region for which the breeding is performed.

The seed type is also characterized by a low number of leaflets on the leaf, which number gradually increases as the extreme tall type is reached. Another clear difference consists in the agreeable smell of the leaves of the long types and the rather unpleasant smell of the short ones.

The main problem in hemp breeding is the improvement of fibre quality, which will be done on the basis of the method devised by the Mezöhegyeser Hemp Factory for the determination of the fibre content in small samples. A rough test is also the degree of fluting on the surface of the stem, the more fluted stems having a greater likelihood of high fibre content. It is important that comparisons be made only between plants grown at equal spacing and with the same proportion of male plants.

The method of inbreeding followed by hybridization is expected to give striking improvements when it is applied. Sister matings have led to a 50 per cent reduction in yield but an increased uniformity in seed colour and apparently also sex ratio, though this requires confirmation. The inbred plants had a considerably greater proportion of defective pollen grains, of which photographs are given.

744. **SIZOV, A. I.** 633.522:575(47)  
 (On hemp breeding.)  
 Bull. Appl. Bot. Leningrad 1934 : Ser.A(11) : 94-106.

Northern forms when grown in the south are stunted in growth, in very southerly regions owing to the reduced length of day, in less southerly regions because of insufficient moisture. Most southern forms, from Italy, the Caucasus, etc., grow quite successfully in the north, up to latitudes of 60°, though they do not always set seed. As a result of their adaptation to short-day conditions the assimilation of these southern forms is more intense and great possibilities are foreseen from crossing northern and southern forms.

Breeding work with hemp is in progress at a number of stations in the U.S.S.R. Mass selection for uniformity of growth, ripening and thickness of stem, for length of fibres and their relation to the length of stem, compact inflorescence, vegetative period and number of seeds is being practised; attention is also given to tolerance of poor soil conditions, resistance to spring cold, to excess of moisture, drought and pests and diseases. The male plants possessing undesirable characters are removed before flowering begins, and the best female plants are selected at the time of maturity. After one or two generations of selection the lines are kept pure by growing in isolated plots.

Individual family selection is practised by selecting both the male and the female lines and allowing one selected male plant to pollinate a number of females. In addition to the characters enumerated above, length of internode, form of stem and the ratio of stem length to thickness are taken into account. Methods have been devised for estimating the fibre quality on small samples. Isolation by means of parchment or other bags damages the flowers, especially the male ones, and spatial isolation is the only efficient way at present, though improved isolators of celluloid film are also to be used in the future.

The different geographical races, of which there are many, cross with ease one with another if the time of flowering can be adjusted by suitable sowing, photoperiodism or vernalization. Promising plants have been found in the  $F_2$  and  $F_3$  generations of crosses of northern with Italian races and this is thought to be the most promising direction for breeding.

Experiments on the production of artificial mutations have shewn hemp to be tolerant of large doses of X-rays. Similarly, vernalization at 0–10°C. for 30 days had no effect on the time of flowering or maturity.

Significant increases in yield and weight of seed, etc., have been obtained by inbreeding and investigations are in progress on the cytology of sex in hemp and the possibility of producing a monoecious form.

745. MEDWEDEWA, G. 633.525.1:576.312  
Cytologische Studien über Ramie (*Boehmeria nivea* L.) [Cytological studies  
on ramie (*B. nivea* L.)]  
Züchter 1934 : 6 : 228–34.

A cytological examination of the root-tips of twelve geographical races of ramie shewed 28 chromosomes in every case. Macro- and microsporogenesis were studied and only normal development was found. No parthenogenesis was observed.

Although under natural conditions cross-pollination is the rule, self-pollinated flowers developed normally.

746. MEDVEDEV, P. F. 633.525.2  
(The nettles of U.S.S.R.) 633.525.2:575  
Suppl. 71. Bull. Appl. Bot. Leningrad 1934 : Pp. 66.

Though the Soviet Union has led the world in the collection and investigation of the world resources of cultivated plants, little has yet been done to exploit the vast quantities of wild plants occurring in the Soviet Union. Many of these wild plants are very promising as new sources of raw products such as rubber, fibre, etc., and not the least promising of these is the nettle. The present monograph gives a survey of the existing knowledge of the nettle, beginning with a botanical description of the various species, their mode of reproduction, their geographical distribution and their possible means of utilization. *Urtica urens* is recommended as a vegetable on account of its high salt and vitamin content, *U. cannabina* for fibre, *U. dioica* for fibre and paper (varieties *angustifolia* and *platyphylla*), for fodder, the preparation of a green dye from the stems and a yellow dye from the roots, for use of the young tips in salads, for the preparation of potash and oil and as a medicinal plant.

The history of the use of nettles in cultivation is briefly traced and the most successful method of growing them is indicated. The most important condition for successful cultivation is said to be an adequate system of breeding and the author considers as adequate in the case of an uncultivated plant of this type not careful isolation and selection of pure lines, but extensive hybridization, even interspecific and intergeneric, to create variability. The plants are dioecious and anemophilous, though the vigorous shedding of the pollen may effect pollination even on still days. Crossing is effected by applying the pollen with a paint brush or by placing male and female inflorescences together under one isolator.

It will be necessary to make a thorough investigation of the fibre properties of the forms already known, the most promising of which are enumerated. Different races and varieties will then be crossed to combine the uniformity of fibre of some forms with the higher fibre yield and strength of others, with the object of producing forms suitable for the cotton and rope industries and for making various fabrics. Agronomically the characters desired are rapid germination and early growth, response to manuring, uniformity of growth and unbranched habit.

Great interest also centres round crosses with ramie in the allied genus *Boehmeria*, on account of the possibility of uniting the fibre quality of the latter genus with the frost resistance of the nettles. Work on these lines was started in 1932 at Sukhum.

# SUGAR PLANTS 633.6

747. 633.61  
633.61:575  
 PRINSEN-GEERLIGS, H. C.  
 L'amélioration de la Canne par la Sélection génétique. (**The improvement of cane by genetical selection.**)  
 III<sup>e</sup> Cong. Int. Techn. Chim. Ind. Agric. Paris 1934 : 1 : Q4-F., Pp. 5.  
 A brief history of the cane plant is presented from its spread by Arabs and Malays round the Indian ocean and, later, to America, passing from the discovery by Parris and Bovell of the fact that the plant sets viable seed to the finding of the new species, *S. robustum*, by Brandes in New Guinea. H. M. L.
748. 633.61:575(73)  
633.61-2-1.521.6(73)  
 DAVIS, R. L.  
**Sugarcane research in Florida, Georgia and Louisiana.**  
 Agric. Notes P.R. Agric. Exp. Sta. Mayaguez 1934 : No. 68 : Pp. 3.  
 A description of the organization and work of the three field stations maintained by the Division of Sugar Plant Investigations of the United States Department of Agriculture at Canal Point (Florida), Houma (Louisiana) and Cairo (Georgia).  
 At Canal Point the primary aims are early ripening and disease resistance. The cross Coimbatore 281 x P.O.J. 2878, appears to be a very good combination.  
 At Houma, a special improved technique is used for transmitting mosaic so that hundreds of second year seedlings can be tested for resistance. The method of yield testing is described.  
 At Cairo, varieties are tested with a view to obtaining a type high in glucose and ultimately increased syrup production.
749. 633.61:575(96.9)  
633.61-2-1.521.6:575(96.9)  
 MOIR, W. W. G.  
**Improvement in yields of sugar cane in Hawaii by genetic selection.**  
 III<sup>e</sup> Cong. Int. Techn. Chim. Ind. Agric. Paris 1934 : 1 : Q4-E, Pp. 11.  
 An historical account is given of the varietal changes which have taken place since cane was introduced into Hawaii. The first introductions were made by the Polynesians in the early centuries A.D. These are all inferior and were replaced by Lahaina (= Bourbon or Otaheite), which became the dominant cane until it was overcome by disease at the end of last century, when it was replaced by further introductions, Rose Bamboo and Yellow Caledonia in unirrigated areas and Striped Tip, Yellow Tip and D 1135 in the high lands and poorer soils. In the irrigated areas Lahaina gave way to D 1135 and Yellow Caledonia later and these, in turn, to H109, a seedling from Lahaina obtained in 1905, which has become the dominant cane of Hawaii.  
 A description is then given of the extended crossing programme to which this success gave an impetus. To enable this programme to include the best canes of other countries the quarantine regulations were amended and, in technique, the sulphurous acid method of preserving the pollen parent was worked out. A large series of controlled crossings have been made in recent years and the most promising of these are briefly summarized. Besides yield and quality of juice, the major considerations are resistance to eye-spot (*Helminthosporium sacchari*) and brown-stripe (*Helminthosporium stenospilum*) with leaf-scald (*Bacterium albicans*) and chlorotic streak (organism unknown) assuming prominence.  
 The methods of producing and raising seedlings and of testing their agricultural qualities are described and a table is added showing the areas under each variety occupying over 1,000 acres. H. M. L.
750. 633.61:575.11(73)  
 SARTORIS, G. B.  
**Genetic improvement of sugar cane.**  
 III<sup>e</sup> Cong. Int. Tech. Chim. Ind. Agric. Paris 1934 : 1 : Q.4-D, Pp. 5.  
 The paper gives an account of the programme of the United States Division of Sugar Plant Investigations of which the author is pathologist.

The most important characters for the U.S. sugar tract are early maturity and ability to resist disease, adverse climate and other unfavourable conditions. To obtain all these it is necessary to resort to species hybridization. At the Field Station, Canal Point, Florida, the crosses employed are Co 281 x US 1694, Co 281 x POJ 2878, Co 281 x NG 251 (a new species from New Guinea generally known as *S. robustum*) and POJ 2725 x CP 1165. The method adopted is one of modified convergent improvement. This method is described with especial reference to the facts of cane breeding, namely that reciprocal back-crosses are not possible since emasculation of the flowers is impossible. The whole process is complicated by the occurrence of polyploidy, the possibilities of which are briefly discussed.

It is pointed out that, though the method is slow, it offers the same possibilities of obtaining useful varieties as a system based purely on chance. The results of three years work appear to substantiate the assumptions underlying the programme. H. M. L.

751. BOURNE, B. A. 633.61:575.127.5:633.62-2-1.521.6  
**Some pathological observations on sugar cane x sorghum hybrids in Florida.**

Phytopathology 1934 : 24 : 1314-15 (Abst.)

Hybrids between the sugar cane variety P.O.J. 2725 and two varieties of *Holcus sorghum* var. *saccharatus* Bailey have been successfully grown in Florida. The sugar cane parent is not infected with mosaic under Florida conditions, is nearly immune to red rot of the sheath (*Colletotrichum falcatum*) but is susceptible to eye spot (*Helminthosporium ocellum*), brown stripe (*H. stenospilum*) and brown spot (*Cercospora longipes*). The sorghum variety may be infected with mosaic but is not attacked by the other diseases of sugar cane. It is most susceptible to leaf rust (*Puccinia purpurea*). Of the hybrid progeny two-thirds are susceptible to the two diseases caused by *Helminthosporium*, one-third to brown spot and one-fourth to red rot of the sheath. Two years observations have shown immunity to mosaic in the hybrids, though these results are not considered final. No leaf rust has been found.

752. NOYEN, J. 633.61:575.42  
 Sélection de la canne à sucre. (Sugar cane selection.)  
 Journées Agron. Colon. Gembloux 1933 : 174-81.

A brief and general account of anthesis, some inter- and intra-variety correlations and the principles of cultivation and selection.

753. KOPP, A. 633.61:575.42(44)  
 La Sélection de la Canne à Sucre dans les Colonies Françaises. (Sugar cane selection in the French colonies).

III<sup>e</sup> Cong. Int. Techn. Chim. Ind. Agric. Paris 1934 : 1 : Q4-G, Pp. 10.

The crises in the French sugar producing Colonies, Réunion and the Antilles, were political and financial rather than technical, and no steps were taken in the early days when the raising of seedling canes was first adopted elsewhere. It was not till 1917 that a decision was taken to start an agricultural station in Guadeloupe. During the last seven years three or four clones have been evolved which appear interesting.

In Reunion it was only in 1929 that a genetical service was established by the "Syndicat des Fabricants de Sucre" when the island was filled with an intense mixture of varieties resulting from random introductions. Here the main problems are the substitution of a rich cane on the windward side and a mosaic resistant cane on the leeward side of the Island. H. M. L.

754. CANLAS, G. L. 633.61:575.42(91.4)  
 Study of the second and third year selection of seedling sugar canes grown in 1928-1929 cane breeding season in the College of Agriculture.  
 Philipp. Agric. 1934 : 23 : p. 559. (Abst.)

A description of four years selection of P.B. (Plant Breeding) cane and talahib seedlings, combined with a study of the agronomic characters displayed. Ultimately fourteen seedlings were chosen of which twelve were of sugar cane parentage and two were from talahib seedling canes. The majority of the final selections were free from the major diseases of cane.

755. STEWART, G. 633.63:575.14:581.44  
**Abnormalities in inbred alfalfa and sugar-beets.**  
 J. Hered. 1934 : 25 : p. 449.

A broad belt-like proliferation of a branch on a sugar beet plant that occurred in three successive generations in one partially inbred sugar beet stock is described.

756. LÜDECKE, H. 633.63:581.143.26.03  
 Jarowisations-Versuche mit Zuckerrüben. (**Vernalization experiments with sugar beets.**)  
 Dtsch. landw. Pr. 1934 : 61 : 481-82.

Experiments were made with Klein Wanzleben E sugar beet seed. On 5th February, 1934 the experimental seeds were moistened with three successive doses of water, left for 24 hours at room temperature, and on 6th February both moistened and unmoistened seeds were placed in an ice chest, where they remained, with frequent stirrings, at a temperature of  $+3^{\circ}$  to  $+4^{\circ}\text{C.}$ , until 20th March, i.e. for 42 days. The seeds were then dried at room temperature and sown on 11th April. The germination was good and equal to that of other beet varieties untreated.

Counts were made of the number of bolters on 31st July and on 4th September 1934. Only one plant bolted, this being in the treated plot. The neighbourhood of Bernburg in which the experiments were done is very free from bolting and these negative results make the author doubt whether the bolting reported by Lowig at Bonn (See above Abst. 604) is correctly to be ascribed to the vernalization treatment.

#### STIMULANTS 633.7

757. ELVERS, I. 633.71:575.127.2:576.354.4  
**Interspecific hybridization in *Nicotiana*.** XIV. The cytology of  $F_1$   
*glutinosa* x *tomentosa*.  
 Univ. Calif. Publ. Bot. 1934 : 17 : 341-53.

Two new *Nicotiana* amphidiploid hybrids have recently been found in the culture of the University of California Botanical Garden, "*disualovii*" (*N. suaveolens* x *N. Bigelovii*) and "*diglutosa*" [*N. glutinosa* ( $n = 12$ ) x *N. tomentosa* ( $n = 12$ )]. The diploid  $F_1$  of the latter cross is here described. The external morphology of the diploid and amphidiploid was similar and the plants differed mainly in the increased fertility of the latter.

The reduction division was studied in the pollen mother cells and some observations were made of the somatic chromosomes.

At mid-pachytene both paired and unpaired threads occurred and from this and other evidence a lack of homology is indicated. The number of bivalents at meta-anaphase was very variable, 2-9. The second division was regular with the expected variable number of chromosomes on the two spindles and the consequent complete sterility of the hybrid.

The data which bear on the association of homologous and non-homologous chromosomes are discussed.

758. MÜNTZING, A. 633.71:575.127.2:576.354.4  
**Chromosome behaviour in some *Nicotiana* hybrids.**  
 Hereditas, Lund 1935 : 20 : 251-72.

A cytological investigation was made of the pollen mother cells of the  $F_1$  hybrids of the cross *N. bonariensis* Lehm. x *N. Langsdorffii* and of *N. glutinosa* x *N. tabacum*; the synthetic species *N. digluta* was also examined. In the hybrid of the first cross the unexpected number of 0-4 trivalents was found,  $3_{111} + 4_{11} + 1_1$  being the most frequent configuration, and a number of other irregularities was observed. One count showed 18 per cent of good pollen. The *N. glutinosa* x *T. tabacum* hybrid had 36 chromosomes which conjugated loosely according to the Boreale scheme; 0-6 bivalents with  $4_{11} + 28$ , as the most typical configuration were observed. Trivalents were occasionally seen and other irregularities are noted. No unreduced male gametes were found, which supports the conclusion that *digluta* arose by a somatic doubling.

In the examination of *digluta* material, instead of the expected 72 chromosomes  $\pm 68$  were found in an  $F_6$  plant. Only bivalents and univalents were observed at meiosis. Four other plants examined also showed 68-69 chromosomes, which demonstrates the instability of *N. digluta* and the possibility that derivative lines may arise.

759. BEISSER, E. 633.71:575.127.2:576.356  
Zytologisch-genetische Untersuchungen an den Bastarden *Nicotiana tabacum* x *N. Rusbyi* und ihren Rückkreuzungen zu *N. Rusbyi* und *N. silvestris*. II. Die Nachkommen aus unreduzierten Eizellen. (Cyto-genetical investigations on the hybrids *N. tabacum* x *N. Rusbyi* and their back-crosses to *N. Rusbyi* and *N. silvestris*. II. The progeny from unreduced egg-cells.)  
Z. indukt. Abstamm.—u. VererbLehre 1934 : 68 : 1-21.

The cytology of the reduction division of the pollen-mother-cells and the morphology of eight triple hybrids and of unreduced plants from the cross (*N. tabacum* Cuba x *N. Rusbyi*) x *N. Rusbyi* are briefly described. Five of the triple hybrids were from the cross (*N. tab. macrophylla* x *N. Rusbyi*) x *N. silvestris* and one from (*N. tab. petiolaris* x *N. Rusbyi*) x *N. silvestris*. All the hybrids had 24 bivalents and one or a few more univalents. In a few cases the association between the bivalents was less close than usual and some became separated in the first metaphase.

Morphologically, the triple hybrids were very uniform and intermediate in character between *N. tabacum* and (*N. Rusbyi* x *N. silvestris*). The small, individual variations are attributed to the presence of the extra univalents.

The unreduced back-cross plants shewed a varying number of tri-, bi- and univalents. These plants resembled *N. Rusbyi* in habit except in the shape of the flowers which differed markedly from either parent. The possible mode of origin of the unreduced egg cells is discussed and the data shew that most probably the triple hybrids can only have originated from egg cells in which restitution has occurred during the first maturation division. The case for the unreduced back-cross plants is not so clear but it can probably be assumed that they have originated in the same manner.

760. GOODSPEED, T. H. 633.71:576.312:582  
*Nicotiana phylesis* in the light of chromosome number, morphology, and behavior.  
Univ. Calif. Publ. Bot. 1934 : 17 : 369-98.

The new data on chromosome morphology and meiotic behaviour are summarized and discussed as regards its bearing on phylesis in the genus *Nicotiana*.

The karyotypes of twenty-five species are described. Studies of the bivalent configurations in a number of *Nicotiana* species have established certain general relations between the somatic morphology, the formation and terminalization of chiasmata and the bivalent configurations at diakinesis and metaphase, and further studies on *longiflora*, *alata*, *glauca* and *glutinosa* here described shew that the general relations hold also for these species. The chromosome behaviour in a number of interspecific hybrids is described and the significance of amphidiploidy in *Nicotiana* is discussed.

761. OLMO, H. P. 633.71:576.354.46:576.356.5  
Prophase association in triploid *Nicotiana tabacum*.  
Cytologia, Tokyo 1934 : 5 : 417-31.

The four triploid plants examined resulted from the back-crossing of several monosomic types of *N. tabacum* var. *purpurea* to the normal strain. They had the morphological characters of triploid *tabacum*.

Counts at second metaphase shewed 70-73 chromosomes and the union of a modified diploid gamete with 46 chromosomes from the female monosomic parent with a normal male gamete of 24 chromosomes is suggested in explanation.

Three types of configuration were observed at pachytene; (1) two chromonemata shewing complete synapsis with a third in contact at only one or a few points; (2) partial synapsis in which a chromosome may be associated first with one and then with another chromosome and triple synapsis may occur for considerable lengths and (3) complete synapsis of two chromosomes, the third being entirely unassociated.

The absence of triple synapsis throughout the complete length of the chromosome is due, it is suggested, to the lack of time before the onset of diplotene.

The data are discussed in relation to the results of other workers.

762. LAMMERTS, W. E. 633.71:576.356.52:576.354.46  
**On the nature of chromosome association in *N. tabacum* haploids.**  
 Cytologia, Tokyo 1934 : 6 : 38-50.

The first haploid plant examined came from a cross between coral ♀ x *N. tomentosiformis* ♂ and was typically coral in appearance. As the diploid coral shews 22<sub>II</sub> + 1<sub>IV</sub> in about 50 per cent of its cells it was expected that the haploid plant would shew a large number of cells with one bivalent. Contrary to expectations a large number of bivalents were found in many cells at first metaphase. An unusually large number of fragments were also present.

Two normal haploid plants of *N. tabacum* were therefore re-examined and though a number of bivalents were observed, the maximum amount of association was definitely less than found in the coral haploid.

A comparative study was made of the pachytene stage in the normal and coral haploids. The number of paired threads was far greater in the coral haploid but except in the case of what is assumed to be the translocated duplicate coral segment the chromosomes, to judge from their morphology, in part at least, were non-homologously paired. Foldbacks and T-shaped configurations were also observed.

Very little association was found in the normal haploid and no homologous pairing was observed. The occurrence of fragments is explained by the assumption of crossing-over in the non-homologously paired segments and foldbacks. The results of this study shew that the presence of bivalents in haploids and hybrids with variable pairing cannot be taken as complete proof of duplicate segments or homology.

763. HACKBARTH, J. and SENGBUSCH, R. v. 633.71:581.192.6:575.11  
 Die Vererbung des Nicotiningehaltes von *Nicotiana tabacum*. (**The inheritance of the nicotine content of *N. tabacum*.**)  
 Züchter 1935 : 7 : 1-5.

A survey of the distribution of nicotine content within the genus *Nicotiana* shews that the degree of variation is very great in the sections *tabacum* and *rustica*, while in the *petunioides* section only in the species *sylvestris*, *plumbaginifolia*, *Sanderae* and *speciosa* were small amounts of nicotine found.

A plant free from nicotine was selected from within the species *N. tabacum* and other plants either free or poor in nicotine were also found.

Crosses were made between the plants free from nicotine and normal plants and the nicotine content determined by means of the nephelometer.

The presence of nicotine was dominant in the F<sub>1</sub> though not completely so and in F<sub>2</sub> the segregation ratios shewed a clear monofactorial inheritance.

As, however, different strains shew considerable variation in the degree of freedom from nicotine the author suggests the presence of a series of multiple allelomorphs determining this character.

764. 633.73  
 633.73:575

**Coffee in 1931 and 1932. Economic and technical aspects.**  
 Int. Inst. Agric. Rome 1934 : Pp. 231.

It is pointed out in the introduction to this admirable review of the publications on coffee which have appeared during 1931-32, that the world crisis is reflected in the predominance of papers dealing with economic problems and that the possibly more important agricultural and scientific aspects have taken a secondary place.

The literature is divided under the headings, (a) statistical data on production, consumption and prices of coffee in 1931-32 ; (b) the economic position in the various coffee producing countries ; (c) review of works dealing with the technical and ecological aspects of coffee-growing ; (d) diseases and pests of coffee ; (e) the product and its preparation. Bibliographies are appended to each of the last four sections.

Under group (c) the work on selection and hybridization is reviewed and in particular the work of Hille Ris Lambers, some of whose work is summarized in " Plant Breeding Abstracts," Vol. II, Abst. 675. The importance is stressed of the need for accurate knowledge of the behaviour of the mother trees, of the effect of the root stock, of the self-incompatibility of *C. robusta* and of the possibilities in interspecific and intervarietal hybridization, to mention only a few of the outstanding genetical problems still awaiting solution.

765. FREIRE, C. V. 633.73(81)  
 Contribuição ao estudo histológico dos cafeeiros do Brasil. (**Contribution to the histological study of the coffee trees of Brazil.**)  
 Rev. Dep. Nac. Café, Rio de J. 1934 : 2 : 925-27.

Comment is made upon the polymorphism of the genus *Coffea* L. and the impossibility of a precise classification and diagnosis of the species. For this reason the author is going to publish a series of descriptions of the vegetative and floral organs of a number of the forms in the botanical garden of the Museu Nacional, with illustrations. The present article is the first of the series.

766. SLADDEN, G. E. 633.73:575.42  
 La sélection du caféier. (**Selection of coffee.**)  
 Journées Agron. Colon. Gembloux 1933 : 182-90.

The methods and technique of selection are described and the methods used in making inter-specific crosses are briefly noted.

767. TASCHDJIAN, E. 633.73-2.452-1.521.6:581.11  
 Identificazione fisiologica di differenti linee di *Coffea arabica*. (**Physiological identification of different lines of *C. arabica*.**)  
 Agricoltura Colon. 1934 : 28 : 428-31.

Two lines of *C. arabica*, Street and Timpont, were seen to differ in their reaction to *Hemileia vastatrix*, the latter line, though less drought-resistant and less regular in yield, being definitely more resistant to the parasite. It proved to have an osmotic pressure slightly higher than that of Street and a very much more vigorous transpiration.

768. KIHARA, H. and HIRAYOSHI, I. 633.79:576.312.332  
 (**The sex chromosomes of *Humulus japonicus*.**)  
 8th Congr. Jap. Ass. Adv. Sci. 1932 : 363-68.

A karyological investigation of male and female plants of *H. japonicus* shews that the three largest chromosomes of the somatic complement represent the sex chromosomes  $X$ ,  $Y_1$  and  $Y_2$ . Open-pollinated plants gave 248 ♀ : 202 ♂ plants ; artificial pollination 44 ♀ : 19 ♂ ; the germination percentage was respectively 94 and 100 per cent. An examination of the behaviour of the sex chromosomes in the prophase stages of the pollen mother cells suggested that the arms of the  $Y$  chromosomes are homologous at least at the distal ends with the long arms of  $Y_1$  and  $Y_2$ . The male of *H. japonicus* is therefore a structural hybrid in Darlington's sense.

#### OIL PLANTS 633.85

769. SAFONOVA, V. V. 633.854.54:575(47)  
 (**Results of breeding linseed.**)  
 Semenovodstvo (Seed Growing) 1934 : No. 2 : 54-55.

Examination of a large number of linseeds in respect of yield, oil content and degree of attack by such fungi as rust, anthracnose, *Fusarium* and *Polyspora* disclosed the existence of certain varieties better than the average in all these respects.

770. SAFONOV, M. D. 633.854.78:575"793"  
 (**The early sunflower "Karlik."**)  
 Semenovodstvo (Seed Growing) 1934 : No. 2 : 52-53.

The dwarf sunflower "Karlik" ripens in 72-76 days compared with the 104-125 days required by the common forms. Experiments are now in progress to breed such early forms resistant to *Orobanche* and rust, with large seeds, high oil content and yield and other desirable qualities. Preliminary observations indicate that this should be possible. The breeding material available shews a wide range of variation in nearly all characters and distinct improvements have resulted from selection.

771. UKRAINSKII, V. T. 633. 854.78-2.5-1.521.6:575  
 (On the question of breeding and seed production of sunflower res-  
 istant to *Orobancha*.)  
 Semenovodstvo (Seed Growing) 1934 : No. 3 : 43-47.

Experiments have shewn that the severity of attack by *Orobancha* races A and B is influenced by temperature and by the hydrogen ion content of the soil and of the cell sap. Neutral soils most favour the development of the parasite. The pH of the cell sap of the host rises during development and this rise is said to be more pronounced in the immune than in the susceptible varieties of sunflower. For instance from the 15th day to the 90th day the pH rose from 4.8 to 7.0 in the roots of one variety immune to A and B, representing a difference of 2.2, and from 4.85 to 6.00, a difference of 1-15 in another. The difference in varieties resistant to A but not to B was 0.45 (5.55 to 6.00) in one case and 0.78 (5.37 to 6.75 [sic]) in another. Peroxidase and respiratory activities are more intense at high pH and this is thought to be connected with the greater resistance. It is also pointed out that the respiratory activity in the virulent race B is twice as intense as in the common race A.

Breeding for resistance should in the light of these observations be carried out only on neutral soils and since parasitism is increased by high temperatures it is absolutely necessary also that breeding work should be done under conditions of relatively high temperature.

#### FRUIT TREES 634

772. GORŠKOV, I. and JAKOVLEV, P. 634:575.127(47)  
 (The possibilities revealed by the achievements of I. V. Michurin.)  
 Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Recon-  
 struction of Agriculture) 1934 : No. 11 : 16-22.

Reference is made to the immense value to Soviet agriculture and breeding of the wild forms and species of many cultivated plants newly discovered by the Soviet expeditions to the centres of distribution. The provision of forms suitable to more northerly cultivation in particular is likely to be achieved by this means and special reference is made to the perennial wheat produced by hybridizing with rye-grass.

The same is now being done for fruit trees. Twenty species of small bush fruits not hitherto used either as fruit or for crossing have been collected at Hibiny. In Siberia all possible kinds of temperate fruits are found and these are not damaged by the frost. Michurin has made use of all these forms, many of them for direct introduction and all of them for hybridization. Whole forests of interesting forms of common fruits, hitherto untouched by the breeder, exist in Transcaucasia and other countries. Many of these are resistant to frost or to drought. Similar forests of walnut, pistachio and other nuts occur in the Central Asiatic republics of the Soviet Union and these, as well as a number of subtropical fruits, are being used by Michurin, whose breeding work has made possible the cultivation in northern regions of all kinds of fruits that would not have been even considered previously.

Michurin's method consists of crossing forms of widely different geographical origin—the wild vines, pears, almonds, etc., of the Far East were crossed with the high-quality varieties of Europe and America—or crossing forms of very different genetic constitution, i.e. interspecific and intergeneric hybridization. Species and genera that will not cross are first united vegetatively at as early an age as possible or else crossed by means of an intermediate form. By this means he has produced over two hundred new varieties of fruits and other plants. At present he is evolving frost-resistant peaches for the central area of the U.S.S.R. and the Crimea. In apples he has evolved sorts that not only grow in such regions as Voronezh but come into bearing at the end of 5-6 years and are of superior quality and flavour.

In whole areas of central and northern U.S.S.R., Siberia and the Urals, fruit growing has been made possible as a result of this work. Attention is now being devoted also to the production of artificial mutation. In 1934 fifty thousand hybrid seedlings were growing at Michurin's station and 948 combinations were made, involving the pollination during that year of 205,057 flowers artificially and 463,942 by means of bees. Mass hybridizations were made at other places too, 150,000 flowers being cross-pollinated at the Moscow station, 80,000 at Leningrad, and 600,000 at others. At present four thousand growers are using Michurin's varieties and sixteen thousand hectares will be under them in the second Five Year Plan.

773. JAKOVLEV, P.

634:575.127(47)

(Michurin and Science.)

Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1934 : No. 11 : 22-26.

Evolution involves the study of all branches of biological science, including that of individual variation. Genetics affords a means of controlling this, of altering natural forms and so of governing the evolutionary process. This is especially so in a country governed on the principles of dialectical materialism. Many errors have been made in biological science through insufficiently thorough knowledge of these principles. Though Michurin carried out his work mainly empirically he nevertheless attacked and solved many problems which were taken up by the biologists of the world many years later—e.g. the questions of "vegetative approach," "intermediate grafts," "the Mentor," "the selection of hybrid seedlings," "dominance and inheritance in stages." Michurin's *forte* has been his practical knowledge and his capacity to apply it to the economic situation of the country. His greatest contribution has been the production of a number of new varieties of fruit trees capable of growing in new regions and resistant to frost and disease. Among his achievements are a hybrid between the sweet and sour cherry named Širpotreb-Černyi, possessed of very deeply pigmented flesh and sap and extremely fine flavour and other qualities making it without a rival in the confectionary industry; interspecific hybrids of gooseberry immune to *Sphaerotheca*; a certain plum hybrid which, though in external appearance no different from others, proved on cooking to have qualities equal to those of the best Turkestan apricot; *Actinidia*, introduced into cultivation for the first time and very high in vitamin C content; a sweet chestnut sufficiently frost-resistant to grow as far north as Leningrad; and the production for the arctic circle of a number of sweet rowans which have proved of interest also for other parts and are being widely grown as fruit trees.

With the object of producing peaches and apricots suited to more northerly regions tens of thousands of interspecific crosses have been made and the results give every promise of success. Efforts towards increased earliness in the apple have resulted in over one hundred plants of Golden Delicious which bore fruit in the nursery when only a year old.

774.

634-1.524:575

634:575.127

\*[The plant resources of the world as initial material in plant breeding. (Botanic-ecological and economical characteristics). No. V. Fruits and small fruits, and their wild relatives.]

Lenin Acad. Agric. Sci., Inst. Pl. Ind., Leningrad 1934 : Pp. 127.

The main breeding problems are the creation of cold-resistant varieties of apples, pears, cherries and plums to enable their cultivation to be extended towards the north and north-east; to increase the range of varieties and improve the quality of those which are already grown in the north; to combine the quality of foreign varieties with the ecological adaption of the local varieties in the south of the Soviet Union; to create cold-resistant forms of the southern fruits and so enable them to be grown further north; to produce early, resistant varieties with regular yield for the whole Union; to introduce into cultivation and to improve the various fruit species of the extreme north; and to obtain uniform and improved root stocks for all fruit trees. Hybridization, inbreeding where it is possible, and vegetative mutation are lines on which breeding is recommended.

The objects of breeding in connexion with the main fruits are outlined in turn, with indications of suitable parental varieties and wild species for the attainment of each particular object. Apples, pears, quinces, plums, cherries, peaches, apricots and almonds are dealt with in this way. The organization of the breeding work is then discussed. The first essential is an exhaustive collection of initial material, consisting of all the standard varieties of the region served, as many as possible of the local and wild forms of the region and the fullest possible collection of the world standard forms and wild forms from the countries with analogous climatic conditions, a special collection of varieties selected for the possession of some particular character or characters and lastly the newest selections, especially those of Michurin.

\* A full summary of this paper is on file at the Bureau.

An account is given of the specific, varietal and racial diversity of the fruit trees of the Caucasus and Central Asia, which constitutes an invaluable fund of new breeding material. The forms thought to be most promising for parents in respect of the different qualities desired are indicated, reference also being made to successful hybrids obtained from many of them by Michurin.

Most of these wild species of the fruit trees can apparently be inter-crossed and crossed with the cultivated forms and as a result of this work it is anticipated that it will be possible to extend the cultivation of many of these species considerably towards the north, into colder and more arid zones, to extend the range of varieties, especially in respect of transportability and quality of flavour, and to create forms more suited to mechanized cultivation. This applies both to the southern fruits like the apricot, peach and plum and to widely grown fruits like the cherry, peach, plum, pear, apple, etc. The U.S.S.R. possesses the zone of origin of many of our fruits, which are present in extraordinary abundance in the Caucasus and Central Asia, and it is vitally important that this wealth of material should be made use of, for if it is once lost it is irreplaceable. The world collection of cultivated and wild fruit trees is enormously large, including over 10,000 named sorts of apples, 5,000 of pears, 3,000 of vines, 2,000 of plums, 1,500 of cherries, 3,000 of peaches and also large quantities of almonds, chestnuts and others. The different species are taken in turn and the main types comprising the world collection are described.

Strawberries have been collected to the extent of 316 cultivated and 89 wild varieties. The 40 best varieties have been selected out for breeding purposes. These are described. They include varieties of *Fragaria grandiflora*, *F. vesca* and *F. elatior*. The varieties are divided into early, medium, late, ever-bearing, high yielding and large fruited varieties and varieties with upright compact growth.

Raspberries and blackberries have been treated similarly, 232 specimens of cultivated and 200 of wild forms have been collected, including *Rubus idaeus* v. *vulgatus* and v. *strigosus*, *R. occidentalis*, *R. neglectus* and various hybrids of both known and unknown origin. Thirty-five varieties were selected for breeding purposes and are described. They are divided into frost-resistant, drought-resistant types, varieties with firm upright stems not requiring stakes, varieties with few spines, large fruits, high quality, late, early and ever-bearing varieties.

Certain varieties which are of value in breeding for special features are indicated, as for instance the strong upright stems of *R. idaeus* v. *strigosus* Mchx. in breeding varieties which do not require staking; the infrequent, soft spines of this variety; and the large fine flavoured fruits of *R. idaeus* v. *vulgatus* Arrhen.

Of currants and gooseberries 366 cultivated, 265 wild and 126 hybrid varieties are growing. The most promising varieties for parents are indicated. Of the wild gooseberries the Altai species *Grossularia acicularis* (Smith) Spach. is of interest for breeding. The plants are low in yield, the fruit is very small, about 1 cm. in diameter, but sweet, juicy, thin skinned, smooth and green with a red flush. It ripens early. The plants are medium in size, the shoots thin and are covered with dense spines. They are resistant to *Sphaerotheca* and to frost. Thus the combination of good flavour, early maturity and resistance to *Sphaerotheca* and to frost, is effected in this species, which is more favourable in this respect than the American species resistant to *Sphaerotheca*. It will need improving in habit, in spinelessness and in the strength of the shoots. The value of the American species for breeding lies in their tolerance of unfavourable conditions and of *Sphaerotheca*, frost and drought and in their vigour, size, compact growth and, in one case, spinelessness. Interspecific hybridization is the line of most promise in gooseberry breeding and it is fortunate that resistance to both *Sphaerotheca* and frost are combined in most of the promising species. Crosses of the large-fruited European with the Altai gooseberry promise to give valuable forms with well-flavoured fruit even in  $F_1$ , whereas the  $F_1$  of European  $\times$  American species are very deficient in this respect. The Altai gooseberry is also favourable because of its early maturity. The best European varieties, being more or less resistant to *Sphaerotheca* and early maturing, are Grüne Flaschenbeere, May Duke, Maurers Sämling and Industry. The  $F_1$  hybrids of these will probably be very spiny. *G. oxycanthoides* L. is the most promising species for crossing for spinelessness, also the French spineless varieties. Back-crossing will probably be necessary to increase the size of fruit. Self-pollination of existing hybrids as also recommended to create material for selection.

A list is given of the varieties of red currants recommended for breeding. Of the wild species,

*R. Warszewiczii* Jancz. is of special interest. It is extremely high yielding, the fruits are larger than the average, sweet, dark red; they are high in acid content, 3.86, low in sugar, 4.90. They ripen extremely late. The bush is strong, high, compact and resistant to anthracnose. The species occurs in Manchuria. The fruits are very promising for preserving.

The species *R. manshuricum* Komas. and *R. multiflorum* Kitt. are also of interest and have very dense, long, multifloral inflorescences. They flower very late. The fruits are red and acid.

Taking the small bush fruits as a whole the main problems are seen to be (1) the creation of frost-resisting varieties, which shall be at the same time early in maturity, so enabling the cultivation to be extended northwards; (2) drought resistant varieties, to extend the cultivation into the arid regions of the south and south-east; (3) varieties suitable for mechanized cultivation, especially in relation to habit, uniformity of ripening and extension of the choice of ripening period in the direction of earlier and later varieties; (4) ever-bearing varieties (of strawberries and raspberries) for southern regions; (5) varieties adapted to certain special conditions and purposes, e.g. for preserving, for transport to other districts, export, dessert, and (6) to improve the quality in general.

775. HAFEKOST, G. 634-1.541.11:575  
Zur Frage der Obstunterlagenzüchtung. (**On the question of breeding fruit tree stocks**).  
Biol. Gen. 1934 : 10 : 607-14.

Attention is called to the lack of genetic uniformity in the root-stocks referred to in commercial circles by a varietal name, which results from the lack of proper control of their hereditary constitution in propagating them. All those produced from seed constitute segregating populations and even in reproducing vegetatively little attention is given by the trade to the uniformity of the source. Reference is then made to the work of the East Malling Research Station in selecting pure root-stock material and in producing new and valuable stocks by hybridization and to similar work by Schindler in Germany. Recommendation is made that work on these lines should be undertaken in Austria where the types of stocks required are somewhat different from those used in Germany and England.

776. JUNGERIUS, N. 634.1:581.162.5  
634.2:581.162.5

Samenvattend overzicht van de bestaande opvattingen omtrent de oorzaken van onvoldoende vruchtzetting bij vruchtbomen, met tabellen van kiempercentages van stuifmeel; resultaten van zelfbestuiving en van kruisbestuiving bij appels, peren, kersen en pruimen. (**A comprehensive survey of the existing views on the causes of deficient fruit setting in fruit trees, with tables of germination percentages of pollen; results of self and of cross-pollination in apples, pears, cherries and plums.**)

Lab. v. Tuinbouwplantenteelt. Landbhogesch. Wageningen 1934 : No. 22 : Pp. 236.

The first part of this pamphlet deals with existing knowledge on sterility in general and in the four fruits mentioned, the inheritance of sterility, environmental factors and pollen germination tests. All available information on self and cross-pollination and some data on germination tests in the cultivated varieties in apples, pears, cherries and plums is presented in tables covering 161 pages and giving the name of the investigator and the place in which the observations were taken.

A bibliography concludes the survey.

777. DORSEY, M. J. 634.11:575.252  
**An evaluation of bud sports in the apple.**  
Trans. Ill. Acad. Sci. 1933 : 25 : 118-19.

Some comments on the possible cytological mode of origin of bud sports are followed by data shewing the numbers recorded of various types of colour sports in the apple.

The possible value of bud sports as a means of improvement and the necessity for their study from the genetic and horticultural standpoints are mentioned.

778. GORCZYNSKI, T. 634.11:576.312:581.331.3  
 634.11:576.354.4  
 Zytologische Analyse einiger Pollenentwicklungsvorgänge bei der Apfelsorte  
 "Schöner von Boskoop." (Cytological analysis of certain developmental  
 processes of pollen in the Boskoop Belle apple.)  
 Acta Soc. Bot. Polon. 1934 : 11 : 103-18.

Flower buds were used in studying the ontogeny of the anthers and pollen grains and the reduction division in the pollen mother cells.

Anther development in the primary archesporous cell stage was normal.

In general, prophase is regular but either degeneration due to vacuolization of the plasma and disappearance of the nucleus or the formation of polynuclear cells, and other aberrations due to a peculiar form of cell fusion, may occur.

The number, shape and arrangement of the bivalents and multivalents were difficult to determine. At diakinesis from 17-24 gemini were observed and Kobel's chromosome number of  $2n = 51$  could not be confirmed.

Various irregularities that may occur are described, including the formation of monads and the occurrence of a form of cytomixis in which cell groups are united by stretches of nuclear plasma.

The ontogeny and development of the cells of the tapetal layer are described in detail.

779. RUDLOFF, C. F. and SCHMIDT, M. 634.11-2.42-1.521.6:575  
*Venturia inaequalis* (Cooke) Aderh. II. Zur Züchtung schorf widerstands-  
 fähiger Apfelsorten. [*V. inaequalis* (Cooke) Aderh. II. On the breeding  
 of scab-resistant varieties of apple.]  
 Züchter 1934 : 6 : 288-94.

At present no variety of apple is known that possesses under all conditions a complete or even satisfactory resistance to scab. There are, however, species of *Malus* which are resistant and cross-breeding appears to be the most likely means of producing scab-resistant varieties.

The first necessity is a suitable and certain method of infection. The authors made use of two different infection methods, which are described, one for mass treatment, the other for individual plants.

The results of tests of varietal and species crosses have shown that it is possible to secure resistant types but in crosses between wild species and cultivated varieties small fruit seems to be dominant. To remedy this, back-crosses are to be made with cultivated varieties.

Up to the present there is no evidence for the existence of biotypes of *Ventura inaequalis*.

780. 634.23:581.162.52  
 634.23:575.252  
 Eine selbststerile Spielart der Schattenmorelle. (A self-sterile sport of the  
 morello cherry.)  
 Obst- u. Gemüseb. 1934 : 80 : 93-94.

A brief note on the paper abstracted in "Plant Breeding Abstracts, Vol. IV, Abst. 1086 with the additional information (from unpublished correspondence from Dr. Schandler) shewing that the long-budded form of the morello cherry is undoubtedly a bud sport.

781. CONDIT, I. J. 634.37:575.12:576.16  
 Anomalous fig trees. Plant shewing chimaeral differences in flower  
 form of value in throwing light on the origin of edible figs.  
 J. Hered. 1934 : 25 : p. 497.

Similar bud sports occurring on two trees from a cross between fig trees (*Ficus carica*) and caprifigs are thought likely to shed some light on the phylogeny of the edible fig.

782. JONES, M. M. 634.54:575.12(73)  
 The Jones hybrid hazels.  
 Nat. Hort. Mag. 1934 : 13 : 262-64.

From 1919 to 1924 a number of artificial crosses were made in which the Rush varieties of American

hazel (*Corylus americana*) were pollinated by the European filberts, Italian Red, Cosford, Du Chilly and Bolwyller. The object of the experiment was to produce a commercial variety suitable to Eastern conditions as hardy as the American hazel with the general good qualities of the standard European types and free from the corky substance found on the kernels of most filberts.

The method of cross-pollination and of inducing the isolated branches, used as a source of pollen, to mature is described.

The Rush x Cosford crosses gave the largest nuts, though not the best in quality, while the cross Rush x Italian Red resulted in the best combination of size and quality. Some of the Du Chilly crosses are regarded as promising.

According to an editorial note reciprocal crosses with Rush pollen failed in all cases. The 1921 hybrids came into bearing in 1929 and are highly fruitful, largely due no doubt to pollen from other hybrids, for as far as is known all European filberts are self-sterile.

783.

634.58  
634.58:575

Monographie de l'arachide. (**Monograph on the groundnut.**)

Rev. Bot. Appl. 1933 : 13 : 689-789 ; 1934 : 14 : 565-632, 709-55, 833-64.

Chapters I-III of this monograph give a comprehensive historical review of *Arachis hypogaea* and its introduction into various countries, a full systematic study of the genus *Arachis* (including an analytical key for the species), descriptions and geographical distribution of species and criteria for distinguishing between races and varieties. The principal varieties known and the standard types of U.S.A. and other regions are considered and the possibility of discovering new types in South America is also mentioned, lists of vernacular names being given frequently.

Chapter IV on the biology, anatomy and physiology, and chemical composition of the groundnut also comprises a section on "genetics" consisting mainly of descriptions of varieties in different parts of the world, with some brief remarks on hybridization, artificial and natural fertilization and the chromosome number and the insignificant results hitherto obtained by selection with a practical aim.

In Chapter V Mlle. M. Th. François deals with the chemistry of the groundnut and its products, while Chapters VI and VII relate to diseases and pests, edaphic and climatological conditions, and the geographical distribution and groundnut production of the various countries of the world.

784.

GRUBER, F.

634.7:519.241:575

Variationsstatistische Untersuchungen über einige wirtschaftlich wichtige Eigenschaften beim Beerenobst. (Vorläufige Mitteilung.) [**Studies in variation statistics of some economically important characters in small bush fruits. (Preliminary communication.)**]

Züchter 1934 : 6 : 294-96.

The characters studied were fruit size, number of seeds and firmness of flesh.

A series of graded sieves was used to classify the fruit size of currants, which shewed considerable varietal variation. The raceme length which is a varietal character was in most cases correlated with the number of flowers and neither is correlated with fruit size.

Definite length and breadth measurements had to be made on gooseberries except on the small fruited varieties.

The results of crosses between European and American gooseberries indicated that fruit size is determined by several factors and repeated back-crosses to the large fruited varieties are necessary.

A whole series of large fruited and very high-yielding types were selected from a number of seedlings of wild strawberries.

In the case of number of seeds, which is of great importance in currants, it is suggested that not

only should the seeds in the ripe berries be counted but the ovules in the flowers also and that the varieties with the fewest ovules should be used in breeding.

Firmness of flesh is of special importance in the strawberry and a method for measuring it is described. Measurements made on a large number of seedlings shewed some with very firm flesh which are to be further tested.

785.

634.7:575(77.3)

634.71:575(77.3)

634.725:575(77.3)

COLBY, A. S.

**The small fruit variety question in Illinois.**

Trans. Ill. Acad. Sci. 1933: 25: 116-18.

At Illinois, research (begun in 1924) on small fruit has been directed towards evolving a gooseberry bearing fruits of superior size and quality on bushes comparatively free from spines and with foliage more resistant to leaf diseases. Over 4,000 seedlings, including several hundred second and third generation hybrids, are now being tested; Columbus x Carrie and Poorman x Transparent have given progenies very promising in fruit and plant characteristics; while Glendale and Carrie selfed produced a number of seedlings superior in plant or fruit characteristics to the parents.

Raspberry breeding was begun in 1922 and 7,000 individuals including second and third generation selfings and crosses are now available as material in the search for more hardy, disease resistant and productive varieties and in the study of inheritance.

A large collection of new plant material comprising various small fruits and grapes, derived from breeders elsewhere and from other sources, is also being tested at the Illinois Station to determine their value as potential new varieties. Some of the most promising new types are specifically mentioned.

786. BOLOGOVSKAYA, R. P.

634.715

**(The blackberry.)**

Sci. Pop. Monograph, Leningrad 1934: No. 51: Pp. 110.

After a brief discussion of the origin of the cultivated forms of blackberry their classification is given. The main agronomic features of a number of the best varieties are tabulated to facilitate the choice of varieties for any particular purpose. Descriptions and illustrations are given of the main species, including hybrid species such as the loganberry and various hybrids produced by Michurin.

In the section on breeding the main subjects as far as the Soviet Union is concerned are enumerated. Frost resistance is the first essential, then immunity to fungus diseases, spinelessness, firm and erect stems, high yield and sugar content of the fruit, and tenderness combined with transportability and reduced acidity.

Most of the improved varieties so far have come from the American species and the many valuable species to be found in the Crimea and the Caucasus have remained untouched. For instance *Rubus caucasicus*, *R. anatolicus* and *R. turkomanicus* are all distinguished by the abundance and large size of their fruit, which is black and shiny and sweet. The forms of *R. caesius* found in the north of the U.S.S.R. and in Siberia are very frost-resistant. The use of these and other species in hybridization is therefore recommended.

The method of hybridization is briefly described, followed by a short outline of the points on which Michurin bases his selections. Selection is mainly carried out in the first to third year of growth though selection for certain points can be made in the cotyledon stage. The characters to be selected are as follows: robustness of the plant as a whole, large leaves with wavy and wrinkled surface, thick shoots, large stipules with regular, undented margins, early acquisition of a dark pigment in the stems (sign of maturity), high quality of fruit and as few spines as possible. Success can only be attained when breeding is undertaken on a sufficiently large scale, but successful breeding is regarded as the main hope for blackberry cultivation in the U.S.S.R. Reference is made to the variety Texas produced by Michurin from a seedling of the loganberry, and characterized by fruits up to 39 mm. in length and 9.55 g. in weight, one bush yielding 7.2 kg. of large well-flavoured berries; it is frost resistant and free from disease.

The methods of cultivation are described.

787.

JOHNSTON, S.

**The cultivation of the highbush blueberry.**

Spec. Bull. Mich. Agric. Exp. Sta. 1934 : No. 252 : Pp. 52.

634.73:575(77.4)

634.73:581.162.3

Mention is made of the blueberry breeding work in progress in Michigan with selections obtained from New Jersey breeders and in a few instances from wild blueberries ; the material used consisted of *Vaccinium corymbosum* and other forms. About 20,000 hybrid seedlings are ready for further trial.

Observations on four varieties shewed that self-pollination was effective and hand-pollination was superior to the method of simply bagging the plants.

788.

DARROW, G. M., WALDO, G. F., SCHUSTER, C. E.  
and PICKETT, B. S.

634.75:575(73)

**Twelve years of strawberry breeding. II. From 170,000 seedlings, seven named varieties : A summary of the crosses made and an evaluation of their effectiveness as breeding material.**

J. Hered. 1934 : 25 : 451-62.

An outline of strawberry breeding by the United States Department of Agriculture, the North Carolina Department of Agriculture and the Oregon Agricultural Experiment Station from 1920 to 1934. Most of the principal crosses and selections are tabulated and a few are described. Seven varieties were produced during the period 1920-1925. The selections of more recent years are still being tested for regional adaptation, disease and pest resistance, colour and quality (Cf. " Plant Breeding Abstracts," Vol. IV, Abst. 777).

789.

FEDOROVA, N.

634.75:575.127.2:576.356.5

**Polyploid inter-specific hybrids in the genus *Fragaria*.**

Genetica 1934 : 16 : 524-41.

From *F. vesca* L. ( $2n = 14$ ) crossed by *F. elatior* Ehrh. ( $2n = 42$ ) 2 pentaploids ( $2n = 35$ ) and 2 tetraploids ( $2n = 28$ ) were obtained. The pentaploids, though morphologically of intermediate type and possessing 2 genomes of *F. vesca* and one of *F. elatior* still shewed strongly marked characteristics of *F. elatior*. The tetraploids resembled *F. vesca*. Both pentaploids and tetraploids were sterile though one of the former set some seed on pollination with *F. elatior*.

From a consideration of genetical and cytological data the writer suggests that these tetraploids were not true hybrids and may have arisen by parthenogenetic development of an embryo from a diploid ovule, with subsequent somatic doubling of the chromosomes.

A preliminary cytological investigation shewed that meiosis (which was investigated in the tetraploids only) was characterized by complete conjugation of the chromosomes, i.e. the formation of bivalents, trivalents and tetravalents.

Hybridization of *F. grandiflora* ( $2n = 56$ ) x *F. elatior* ( $2n = 42$ ) yielded  $F_1$  plants which had  $2n = 49$  and were almost all sterile except one plant from which an  $F_2$  of 25 plants was obtained. On cytological examination these plants revealed a polyploid series with the following distribution : 1 plant  $2n = 42$  ; 3 plants  $2n = 56$  ; 3 plants  $2n = 63$  ; 5 plants  $2n = 77$  ; 1 plant  $2n = 84$  and finally 2 amphidiploids with 98 chromosomes.

Back-crossing the  $F_1$  to *F. elatior* yielded 6 plants of which 2 had a somatic count of 91 and 56 respectively.

The question of the origin of polyploid series of *Fragaria* in nature is briefly touched upon.

790.

GRANER, E. A.

634.771:576.312.35

633.526.1:576.312.35

**Observações sobre o numero de cromosomios na bananeira. (Observations on the chromosome number in the banana.)**

Rev. Agric. S. Paulo 1934 : 9 : 333-40.

In view of the importance of the banana in Brazil, work on its improvement, including hybridization with fertile species of *Musa*, is to be undertaken.

The present study was made on two varieties, one of *M. Cavendishii* Lamb. and one of *M. textilis* Née. Clear counts of 22 chromosomes were made in root tips of *M. textilis* and  $\pm 33$  in *M. Cavendishii*.

At meiosis there appeared to be eleven bivalents and eleven univalents at metaphase in *M. Cavendishii*, the latter being distributed irregularly to the poles and tetrad formation was also irregular. *M. textilis* had eleven regular bivalents at metaphase.

791. HAGAN, H. R. and COLLINS, J. L. 634.774-2.7-1.521.6:575  
**Studies on varietal resistance of pineapple plants. Part II. Plant resistance to *Heterodera marioni* (Cornu) Goodey.**  
 J. Hered. 1935 : 26 : 35-46.

Measurements were made of weight and number of leaves and weight and number of roots of the varieties Cayenne, Lot 520 ( $F_1$  of Cayenne x Wild Brazil) Pernambuco and Wild Brazil and comparisons made of infested and non-infested plants to study the effect of nematode attack on the development of the aerial parts of the plant and the relative resistance of pineapple varieties. Of the varieties tested, the order of resistance was, Wild Brazil, Lot 520, Pernambuco and Cayenne and the weight of leaves, stumps and fibrous roots was adversely affected in the reverse order by nematode attack.

792. HUSFELD, B. and SCHERZ, W. 634.83-1.541.11:575  
 Neuaufbau der Rebenunterlagenzüchtung. (**The reconstruction of vine stock breeding.**)  
 Züchter 1934 : 6 : 280-88.

The methods and aims in the breeding of suitable vine stocks of the Kaiser-Wilhelm Institut für Züchtungsforschung, Müncheberg are described.

The first necessity is resistance to the principal diseases, *Phylloxera*, *Plasmopara*, *Uncinula* and *Pseudopeziza*.

Strains resistant to the first three have been produced but at present spraying with copper sulphate is the only means of control of *Pseudopeziza* but special information on the degree of resistance, segregation and the biology of the pathogen is to be published. Stocks must also be resistant to phylloxera.

Besides these problems of immunity there is the question of resistance to frost and of a satisfactory ripening of the wood.

The type of growth of the stock is also of importance and finally the suitability of the stock for the needs of the wine grower.

793. STUMMER, A. and FRIMMEL, F. 634.835:575.125  
 L'eterogamia nella vite. (**Heterogamy in the vine.**)  
 III Congr. Int. Vite Vino, Roma 1934 : 2 : 320-22.

The effect of heterogamy is seen in the increased weight of the seeds, the higher percentage of germination, the greater vigour of the seedlings and the fewer abnormal plants among them.

794. PALIERI, G. 634.835:581.162.3  
 Ricerche ed osservazioni sulla fecondazione della vite, colatura ed uve apirene. (**Researches and observations on the pollination of the vine, coulure and seedless grapes.**)  
 III Congr. Int. Vite Vino, Roma 1934 : 2 : 270-80.

A short account of the processes of pollination, the various causes of coulure (abortion), pollen sterility and the question of seedlessness.

795. PAULSEN, F. 634.835-1.541.11(45)  
 Gli ibridi porta-innesti creati in Italia nella ricostituzione dei vigneti. (**The hybrid stocks created in Italy in the replantation of the vineyards.**)  
 III Congr. Int. Vite Vino, Roma 1934 : 2 : 281-85.

A survey of the conditions in the vineyards of Italy shews that in many cases little attention is paid to the choice of stock beyond resistance to phylloxera.

It is pointed out that the stocks first distributed were mostly of French origin and mostly unsuited to the great range of conditions in the Italian vineyards.

Experience gained in the experimental vineyards has shewn that the choice of a stock well adapted to its environment may have a very favourable effect on yield and that on the whole the hybrid Italian-American stocks have shewn themselves superior to the French stocks.

Each district should have facilities for the creation and selection of the most suitable stocks to provide the maximum yield.

A list is appended of the hybrid stocks produced by the five principal experimental vineyards of Italy shewing the nature of the soil and the yield of the plants.

796. 634.835-2.4-1.521.6:575  
634.836.7:575  
PIROVANO, A.  
Nuovi tipi di uve da vino resistenti parzialmente alle crittogame. (**New types of grapes for wine partly resistant to fungous diseases.**)  
Ital. Agric. 1935 : 72 : 13-17.

From crosses of I. P. 17 (a hybrid between Grecanico and Ischia precoce, resistant to phylloxera) and Grecanico with other varieties of *V. vinifera*, certain desirable types are described which were selected on the basis of their resistance to fungus diseases, *Peronospora* in particular.

The results indicate the possibility of breeding resistant varieties by crosses within *V. vinifera* without making use of American varieties.

797. 634.851.09  
SEYVE-VILLARD, B.  
Notes sur les hybrides-Viniferas B.-Seyve-Villard. (**Notes on the B.-Seyve-Villard *Vinifera* hybrids.**)  
Prog. Agric. Vitic. 1934 : 51 : 183-85.

A progress report on 18,000 seedlings under observation at Montpellier. Quality, disease resistance, vigour, size of bunch, of berry and yield and the reactions of varieties to soils and stocks are being studied.

Brief notes on the characteristics of 21 hybrids are given.

798. 634.872:575(43.91)  
TELEKI.  
La culture des raisins de table en Hongrie. (**The cultivation of dessert grapes in Hungary.**)  
III Congr. Int. Vite Vino, Roma 1934 : 1 : 394-99.

A short account is given of the history of the cultivation of dessert grapes in Hungary and the principal varieties, many of them hybrids, are described.

## FORESTRY 634.9

799. 634.95.0015(91.4)  
**Forest investigation and research.**

Manual of Procedure Dep. Agric. Comm., Bur. For. Manila 1933 : 225-42.

The Programme of research of the Bureau of Forestry, Manila, includes the study of botanical and silvicultural characteristics and of seed germination and propagation and the lines on which investigations are to be recorded are indicated. The collection of seeds is similarly standardized.

800. 634.97:575  
WETTSTEIN-WESTERSHEIM, W. v. and BEHRNDT, S.  
Über Forstpflanzenzüchtungsversuche. (**On the breeding of forest trees.**)  
Züchter 1934 : 6 : 296-99.

Forestry has not been much concerned with breeding but it can be shewn that the principles of genetics can be profitably applied to the breeding of forest trees.

Experiments on poplars have shewn that propagation by seed can be successfully accomplished and that heterosis in hybrids is of practical value.

Breeding with *Salix* aims at the increase of the tannin content of the cortex.

Experiments with *Pinus silvestris* include studies on the inheritance of the type of bark and resistance to *Lophodermium pinastri*.

The number of types found in *Picea excelsa* and other forest trees of commercial value shews the importance of individual selection.

An experiment on the oak has shewn that selving of forest trees can be accomplished without difficulty.

801. PJATNITSKII, S. S. 634.972:575.14

(Experiments in self-pollination of *Larix*, *Acer* and *Quercus*.)

Acta Inst. Bot. Acad. Sci. U.R.S.S. 1934 : 4 : 297-318.

It was found quite possible to self-pollinate forest trees, and experiments with the species indicated shewed that many valuable new forms and characters may be obtained in this way.

802. VIGNOLI, L. 634.972.1:576.353

Studio citologico sul genere *Quercus*. (A cytological study of the genus *Quercus*.)

Lav. Ist. Bot. Palermo 1933 : 4 : 25-39.

Mitosis was studied in the root tips of *Q. lanuginosa* (three varieties), *Q. Ilex* (five varieties) and *Q. sessiliflora*. Twenty-four chromosomes was the diploid number in each case and with slight modifications mitosis was regular and similar in each species examined.

803. SCHREINER, E. J. and STOUT, A. B. 634.972.3:575.127.2

Descriptions of ten new hybrid poplars.

Bull. Torrey. Bot. Cl. 1934 : 61 : 449-60.

The poplars described were selected on the basis of vigour of growth, ability to root from cuttings, hardiness and disease resistance as being the most promising plants among 69 hybrids chosen from about 13,000 individual seedlings obtained by crossing 34 different types of poplars.

Clones of the ten hybrids are being established and have been allotted a horticultural name. Their performance in forest plantations is to be tested.

804. WELLENSIEK, S. J. and BRUYN, H. L. G. DE 634.972.5:575.22:581.145.1

Variations in the bud-opening of *Fagus*.

Genetica 1934 : 16 : 495-505.

Statistical analysis of the dates of bud-opening in 42 specimens of *Fagus* during a 10 year period shewed the variations observed to be constant and that there were genetic differences in regard to bud-opening.

805. 634.975:581.162.32

634.975:575.42

634.975:575.127.2

PEDERSEN, P. M.

Krydsbestøvningsfaenomenet i vore hedeplantager. (The phenomenon of cross-pollination in our plantations on heath lands.)

Dansk Skovforen. Tidsskr. 1933 : No. 7 : 317-33.

Examples of cross-pollination between the Scots pine and the mountain pine are given ; the necessity for attention to the provenance of seed is emphasized ; and the advantages of careful selection of the trees from which cones are obtained are exemplified by the results from eleven plots in which, though they contained Scots pine, mountain pine and red pine, owing to the clear cut selection little cross-pollination occurred ; the suggestion is that the best and most vigorous individuals have " the capacity to withstand cross-pollination " to which all trees have been exposed.

With the existing wealth of species imported into Denmark from various parts of the world, universal co-operation in the systematic and careful collection of cones from all the best plantations that are well adapted to the climate should yield valuable types for the improvement of forest trees.

A full description is given of the origin of a very successful hybrid between *Larix leptolepis* and *L. europæa*, apparently possessing the same desirable characteristics of the Dunkeld larch, another Japanese x European larch cross.

The new form, which might be called the "Stabrand larch" from its place of origin, resembles the Japanese species in being very hardy and in its marked growth energy. Among the young seedling hybrids, three types occurred, those with light greyish bark (like the European larch), those with a bark like the Japanese form and those with a bark of a type intermediate between the first two. As regards height and growth the intermediate type proved the most vigorous. After a few years all light coloured plants disappeared, having been suppressed by other forms. The Japanese larch apparently possesses an outstanding capacity for transmitting its characteristics to the European form and also for retaining its own essential features essentially unchanged; and it (and the larch in general) should therefore be used as widely as possible in forestry improvement work in Denmark.

806. VERRALL, A. F. 634.975-2.48-1.521.6  
**The resistance of saplings and certain seedlings of *Pinus palustris* to *Septoria acicola*.**  
 Phytopathology 1934: 24: 1262-64.

A comparison of seedlings and saplings resistant and susceptible to brownspot needle blight (*Septoria acicola*) indicated that the greatest ability of the host plant to produce resin was one of the factors concerned in resistance.

## VEGETABLES 635

807. BREMER, H. 635-2-1.521.6  
 Zum Stand der Frage: krankheitswiderstandsfähige Sorten im Gemüsebau.  
 (On the position of the question of resistant varieties in horticulture.)  
 Mitt. dtsh. LandwGes. 1934: 49: p. 112.

A great variety of diseases and pests of garden vegetables is referred to, for which no varieties immune or even resistant exist; others in respect of which certain resistant strains are said to exist but have been insufficiently utilized.

808. MAEDA, T. and SASAKI, T. 635.15:576.354.4:576.354.46  
 (Chromosome behaviour in the pollen mother cells of "Shōgoin-daikon" and "Nerima-daikon", the horticultural varieties of *Raphanus sativus* L.)  
 Jap. J. Genet. 1934: 10: 78-83.

At diakinesis in the pollen mother cells of the "Shōgoin-daikon" and "Nerima-daikon" varieties of *R. sativus* a quadrivalent or sexavalent chromosome (consisting of univalents attached end-to-end in a chain but without ring formation) is often observed among the bivalents. At early metaphase these multivalents are resolved into two bivalents or three bivalents from the quadrivalent and sexavalent respectively. Multivalent chromosomes rarely occur in the metaphase equatorial plate, and from metaphase onwards chromosome behaviour is normal. Chiasmata in metaphase are all terminal.

809. TIOUTINE, M. G. 635.22:575  
 635.22:575.127.2  
**Breeding and selection of sweet potatoes.**  
 J. Hered. 1935: 26: 3-10.

The sweet potato, *Ipomoea batatas*, usually fails to flower even when it is an important crop plant, and is propagated vegetatively.

At the Research Institute of Sub-tropical Cultures, Sukhum, U.S.S.R. many varieties flower abundantly and this is found to be a varietal character.

The plant is normally cross-pollinated by insects but the results of artificial pollination shew that a small proportion of the flowers is self-fertile. Anthesis and the technique for artificial

hybridization are described. A large number of crosses to improve the quality have been made and some of the hybrids shew promise.

Seedlings from hybrids of crosses made at the Hawaiian Experiment Station have been grown and from one cross promising seedlings have been obtained.

Interspecific crosses have been made between *I. batatas* and *I. fastigiata*, *I. pandurata* and *I. macrorrhiza* and the work is to be continued.

810. MILLER, J. C. 635.34:575(76.3)  
**Louisiana Copenhagen cabbage. Methods of breeding and description.**  
 Bull. La. Univ. Agric. Exp. Sta. 1934 : No. 260 : Pp. 11.

The aim of this investigation was to produce a strain with small to medium sized compact heads, of high quality, which was also resistant to premature seeding and to cold. The technique, which is described in detail, allowed of examination of the internal characters of the head such as short core, upright head leaves, etc., for selection purposes. After five generations of inbreeding and selection the desired type was obtained.

811. MORINAGA, T. 635.34:575.127.2:576.354.4  
 635.34:576.16  
**Interspecific hybridization in *Brassica*. VI. The cytology of  $F_1$  hybrids of *B. juncea* and *B. nigra*.**  
 Cytologia, Tokyo 1934 : 6 : 62-67.

*B. juncea* ♀ ( $n = 18$ ) was crossed with *B. nigra* ♂ ( $n = 8$ ) and one  $F_1$  hybrid plant was obtained. At diakinesis 8 bivalent and 10 univalent chromosomes were always observed and their behaviour corresponded to the *Pilosella* type of the *Drosera* scheme.

Allosyndesis of the eight chromosomes of *B. nigra* with eight of the chromosomes of *B. juncea* is assumed.

A classification of the cultivated species of *Brassica* according to the constitution of their genomes is given and is to be fully discussed elsewhere. On this basis *B. juncea* is an amphidiploid species with the 10 chromosomes of the first group, comprising five elemental species, and the 8 of the second group represented by the elemental species *B. nigra*.

812. MILLER, J. C. 635.347:575  
**Collards. A truck crop for Louisiana.**  
 Bull. La. Univ. Agric. Exp. Sta. 1934 : No. 258 : Pp. 7.

The origin, plant characteristics and cultivation of the collard, *Brassica oleracea* var. *acephala*, a kind of large kale belonging to the headless cabbage group, are briefly dealt with.

In 1930 a breeding programme was started to obtain a uniform type of plant having a deep compact rosette centre, leaves with short petioles and free of purple or red colour. After four generations of inbreeding and selection a new superior strain (which will be known as Louisiana Sweet Collard) has been evolved and is being used to fix the required type by further breeding.

813. LESAGE, P. 635.563:575.31"793"  
**L'hérédité de la précocité acquise en 1934. (Heredity of acquired earliness in 1934).**  
 C.R. Acad. Agric. Fr. 1934 : 20 : 1033-37.

A further progress report (see "Plant Breeding Abstracts," Vol. IV, Abst. 805) in which provisional data are given on the number of generations during which the acquired character of earliness persists in the experimental cress plants.

In the author's view the observations so far support the theory of the inheritance of acquired characters and refute the other possible interpretations mentioned.

814. LESAGE, P. 635.563:575.31“793”  
 Sur l'hérédité de la précocité acquise dans le *Lepidium sativum*. (On the  
**inheritance of acquired earliness in *L. sativum*.**)  
 C. R. Acad. Sci. Paris 1934 : 199 : 971-73.

Some 1934 data in defence of the author's experiment on the inheritance of acquired earliness. The case for the inheritance of an acquired character is regarded as proved but the period of persistence of the character still remains to be determined. (Cf. Abst. 813).

815. SINNOTT, E. W. 635.62:575.11-181  
 635.62:575.061.1  
**Evidence for the existence of genes controlling shape.**  
 Genetics 1935 : 20 : 12-21.

From a study of the inheritance of fruit characters in *Cucurbita pepo* the author has established five distinct lines of evidence which support his hypothesis that there exist genes directly controlling shape and independent of those determining volume or weight. These lines are :—(1) the independent inheritance of the genes controlling shape and size ; (2) the absence of a correlation between shape and weight in  $F_2$  and no evidence for linkage ; (3) the sharper segregation for shape index than for dimensions ; (4) the negative correlation between length and width in  $F_2$ , the absence of cross-overs pointing to the absence of linkage, and (5) the variability in length is double that of width in the  $F_2$ . The importance of this conclusion is discussed in relation to questions of evolution and development.

816. SCHERMERHORN, L. G. 635.64 Rutgers  
 635.64:575  
**Scientific breeding gives New Jersey the Rutgers tomato.**  
 N.J. Hort. Soc. News 1934 : 15 : 635-36.

The history and description of the Rutgers tomato obtained from a cross made in 1928 between the Marglobe and J.T.D. varieties and named in 1934 is given. The new variety, which ripens early, consistently yields a heavy crop of fruit uniform in shape with bright red, firm flesh and smooth exterior. It is suitable for canning, market and home garden cultivation, while for manufacturing purposes it yields a highly coloured juice of fine flavour.

817. LINDSTROM, E. W. 635.64:576.356.5:575.115-181  
**Segregation of quantitative genes in tetraploid tomato hybrids as evidence for dominance relations of size characters.**  
 Genetics 1935 : 20 : 1-11.

The material consisted of hybrids from the cross between the Red Currant variety of the wild species *Lycopersicon pimpinellifolium* and a larger fruited, pedigreed strain of *L. esculentum*. From the  $F_1$  hybrids, diploid and tetraploid  $F_2$  plants were obtained for comparison by the callus method.

In contrast to other characters the fruits of the tetraploid were smaller than those of the diploid. Fruit size was taken as weight of fruit in grams and the results plotted on an arithmetic basis shew that both the mean and standard deviation of the diploid  $F_2$  are larger than those of the tetraploid and the differences are statistically significant.

Two possibilities are advanced in explanation of the small fruit size in the  $F_1$  and  $F_2$  hybrids ; either it is the result of partial dominance or of a geometric development of the genes. On the whole the evidence is interpreted in favour of the assumption of a partial dominance of the genes for small fruit size combined with an additive action of the size of the genes.

The possibility of some geometric action is, however, not excluded.

As in the case of qualitative characters of tetraploids a certain amount of chromatid segregation takes place leading to the occurrence of fewer recessive combinations than in the diploid.

818. ALEXANDER, L. J. 635.64-2.484-1.521.6:575.11

**Leaf mold resistance in the tomato.**

Bull. Ohio Agric. Exp. Sta. 1934 : No. 539 : Pp. 26.

Of 180 varieties of *Lycopersicon esculentum* tested for resistance to leaf mould, *Cladosporium fulvum*, only five shewed a fair resistance. *L. pimpinellifolium* was resistant. Reciprocal crosses between the two fairly resistant varieties Stirling Castle and Satisfaction and susceptible varieties with desirable characteristics shewed that the type of resistance in Satisfaction was dominant and that in Stirling Castle recessive. As no better types of resistance occurred among the progeny the lines were not continued.

Two off-type plants were found on different occasions among Globe varieties and shewed a high resistance to leaf mould. The genetical analysis of resistance was made on the progeny of the one whose  $F_1$  had the highest proportion of resistant plants. Of the resistant plants tested there were two  $F_2$  families which gave only resistant progeny and progenies homozygous for resistance occurred in the  $F_4$ .

The best of the  $F_1$  plants were crossed with varieties Globe and Marhio and the data derived from the subsequent generations indicate that resistance is dominant but are not sufficient to determine the number of genetical factors involved. One or probably more factors are suggested. No evidence was obtained for the existence of physiological races of the pathogen.

The selection of homozygous resistant plants with the most desirable characteristics, followed by back-crossing to the desirable type is the method to be adopted in order to improve the quality of the resistant strains.

819. 635.646:576.312.35

TOKUNAGA, K.

633.842:576.312.35

**Studies on the chromosome numbers of some species in Solanaceae.**

Jap. J. Genet. 1934 : 9 : 231-38.

The chromosome numbers of 49 garden varieties of *Capsicum annuum* was found to be 12n, of 37 garden varieties of *Solanum Melongena* 12n, of *S. Lyratum*, *S. sisymbriifolium* and *S. Dillenii* 12n, of *S. miniatum* 24n and *S. nigrum* 36n. 12n was found for three species of *Physalis* and 24n for two other species. Two species of *Datura* investigated shewed 12n, *Nicotiana longiflora* shewed 10n and *N. tabacum* var. *angustifolia* 24n.

820. JANAKI AMMAL, E. K. 635.646:576.356.5

**Polyploidy in *Solanum Melongena* Linn.**

Cytologia, Tokyo 1934 : 5 : 453-59.

The triploid plant ( $2n = 36$ ) examined has already been described (see "Plant Breeding Abstracts," Vol. II, Abst. 714); it was highly sterile but repeated selfings produced a fruit with 14 seeds all of which germinated. Of the 13 surviving plants two were tetraploids ( $2n = 48$ ) the rest aneuploids with 44-47 chromosomes. Union between a diploid egg cell and a diploid pollen grain is assumed. Meiosis in the diploid and triploid is briefly described.

821. 635.651:576.16(49.6)

SCHEIBE, A.

635.656:576.16(49.6)

Über Vorkommen und Nutzungsweise der Wilderbse (*Pisum elatius* Stev.) und der "Wildbohne" (*Vicia narbonensis* var. *intermedia* Strobl) in Anatolien. [The occurrence and utilization of the wild pea (*P. elatius* Stev.) and the "wild bean" (*V. narbonensis* var. *intermedia* Strobl) in Anatolia.]

Züchter 1934 : 6 : 234-40.

A description is given of the two forms concerned, their distribution and use in Anatolia, and the question of their relationship to the cultivated beans and peas of to-day is discussed.

822. LAMPRECHT, H. 635.652:575.11.061.1:581.46

Zur Genetik von *Phaseolus vulgaris*. X. Über Infloreszenztypen und ihre Vererbung. (On the genetics of *P. vulgaris*. X. On the type of inflorescence and its inheritance.)

Hereditas, Lund 1935 : 20 : 71-93.

For the gene pair that determines unlimited-limited growth of the axis the symbol *Fin- fin* is suggested.

The data on the structure of the inflorescence in *Phaseolus* are discussed and further details are given of its structure in *P. vulgaris*.

Crosses were made for the investigation of the following characters: unbranched-branched inflorescence, the presence of accessory inflorescences and number of internodes per inflorescence. In the  $F_1$  the unbranched type of inflorescence was completely dominant and the number of nodes was intermediate.

The segregation in  $F_2$  for unbranched-branched inflorescence was monofactorial and the symbol *Ram-ram* is used to designate the gene pair concerned. As regards the inheritance of single, double and triple branched types of inflorescences, only in the last case could the existence of a gene pair *Iter-iter* be established. The data indicate that the formation of accessory inflorescences is probably a modification and is not genetically conditioned.

There was a positive correlation between the branched type of inflorescence and number of nodes of the inflorescence.

823. LAMPRECHT, H. 635.652:575.11.061.6:581.48  
 Zur Genetik von *Phaseolus vulgaris*. IX. Über den Einfluss des Genpaares *R-r*  
 auf die Testafarbe. (On the genetics of *P. vulgaris*. IX. On the effect of the  
 gene pair *R-r* on the colour of the testa.)  
 Hereditas, Lund 1935 : 20 : 32-46.

A genetical analysis was made of a cross between two varieties of beans differing in testa colour and involving segregation of the genes *J-j* and *R-r*. *R* when heterozygous produces, in this cross at least, a marbled effect, which may be very slight. There are, therefore, now two kinds of marbling due to heterozygosity which, to avoid confusion, are designated as the *Cc* marbling and the *Rr* marbling. The segregation of the gene pair *R-r* is of the *Zea* type and the heterozygous condition is difficult to distinguish from the recessive. *R* causes no coloration of the margin of the hilum. The results of this cross shew that the gene pair *J-j* and *R-r* are inherited independently.

The work of Shaw and Norton on testa colour is discussed, the author disagreeing with their hypothesis.

For other papers of this series abstracted in "Plant Breeding Abstracts" see Vol. III, Abst. 753.

824. SMITH, F. L. 635.652:575.11.061.633  
 Pale, an hereditary chlorophyll deficiency in bean.  
 J. Amer. Soc. Agron. 1934 : 26 : 893-97.

A genetical analysis of a pale mutant bean found among a white-seeded selection from the cross Robust x Pink shewed that the character behaved as a simple recessive to which the symbol *pa* has been assigned.

825. MALINOWSKI, E. 635.662:575.125  
 635.662:575-181:581.143.26.035  
 O wpływie długości dnia na bujność mieszańców fasoli. (Effect of the relative  
 length of day and night on hybrid vigour in *Phaseolus vulgaris*.)  
 Rocz. Nauk Rol. 1934 : 33 : 50-58.

In the  $F_1$  from *P. vulgaris* var. *oblongus melleus* x dwarf Haricot Inépuisable, heterosis is exhibited in plant height, number and length of internodes and leaf size, but the time of flowering is greatly retarded and maturity is not reached till October. On the other hand if exposed to light for eight hours daily, the  $F_1$  plants complete flowering about six weeks earlier but are much smaller. They resemble the *P. vulgaris melleus* parent in size and also in leaf type, though their hybrid nature is evident from their seed colour which is dark brown with yellowish brown markings.

826. LAMPRECHT, H. 635.652:575.242:581.45  
 Zur Genetik von *Phaseolus vulgaris*. XI. Eine Mutante mit einfachen Blättern und ihre Vererbungsweise. (On the genetics of *P. vulgaris*. XI. A mutant with entire leaves and how it is inherited.)  
 Hereditas, Lund 1935 : 20 : 238-50.

A mutant plant with entire leaves found among plants of the Swedish variety Favorit is described. The mutant also differed from the standard varieties in pod shape, seed shape, genotypical constitution for testa colour and time of ripening. Besides the entire leaves bifoliate and trifoliate leaves in varying proportions occurred on the same plant. The fertility was normal. The arrangement of the stipules on the leaves of the normal and mutant plants is discussed and is held to invalidate Goebels' view that the stipules, at least in this case represent reduced leaves. A cross between the mutant and a normal strain shewed that the mutation behaved as a simple recessive and the symbol *Uni-uni* is proposed for this factor pair. No linkage was found between *Uni-uni* and the genes *P-p*, *C-c* or *B-b*. The *Uni-uni* gene pair is compared with a similar pair found in *Pisum* (see "Plant Breeding Abstracts," Vol. IV, Absts. 825 and 826).

827. BELSKAJA, T. N. 635.652:575.255:581.48  
 [Inheritance and ontogenetic distribution of seeds of changed colour in *Phaseolus vulgaris* L. v. *sphaericus haematocarpus* Savi (Mart).]  
 Timiriaseff Biol. Inst., Moscow : Phenogenetical Variability 1933 : 2 : 11-50.

The phenomenon referred to as "*Obscuratum*" by Kajanus, consisting in the occurrence of certain seeds with a reversal of the colour of the pattern and the background, the pattern becoming light and the background dark, was made the subject of further study. Very occasionally—two or three in five years—seeds with no light patches at all were encountered. On such seeds, and on seeds with large dark patches, a faint suspicion of the pattern could sometimes be detected, suggesting a chimaeral character as assumed by Tjebbes. Three plants with pink spots on the standard of the corolla of some of the flowers gave ordinary seeds, again suggesting that the seed abnormalities are chimaeral rather than factorial. Another type was observed in which the coloured spots were raised above the surface of the seed coat; this sometimes appeared on one side of the seed only, or sectorially, but never at random over the whole seed. It is also probably a chimaeral form.

Experiments on selection were started on material obtained by N. P. Krenke by three generations of selection in the progeny of one original plant shewing the *obscuratum* phenomenon. Lines were selected in three directions, plants having a high proportion of *obscuratum* seeds, plants have an average proportion and plants having few; two plants having none at all were also selected. In the case of the high *obscuratum* plants both *obscuratum* and normal seeds were sown to produce the progeny, not only the *obscuratum* seeds. After five years of selection the progeny from the high *obscuratum* plants had a significantly higher percentage of *obscuratum* seeds than those from the low lines. The five plants with the highest percentage were all descended from a single pod in which all the seeds were *obscuratum*. Other such pods however did not necessarily produce progeny with a high percentage of abnormal. The difference in percentage of abnormal seeds in the progeny of abnormal and normal plants was 5.483 in 1928, 8.286 in 1929, 7.505 in 1930 and 4.713 in 1931. Examination of the individual progenies of the plants in the high group shewed a slight excess of *obscuratum* in the progeny of the *obscuratum* seeds compared with the progeny of the normal seeds from the same plants, but this difference was not significant in 1929; in 1931 the difference was significant and transmitted to the progeny, whilst in 1930 the difference was in the other direction. The average over a period of three years was not significantly different, being actually higher in the progeny from the "normal" seeds (7.868 as compared with 6.329 per cent from the *obscuratum*); this clearly shews that the "normal" seeds from plants bearing *obscuratum* seeds are constitutionally like the abnormal seeds and are genetically distinct from the normal seeds from normal plants, which gave an average over the same three yearly period of 2.453 per cent *obscuratum* plants. To illustrate this further the progenies of fifteen plants were examined separately: in six plants the progeny of the *obscuratum* seeds had a higher proportion of *obscuratum* than that of the "normal" seeds, in

five plants it had less and in four the proportions were the same. The coefficient of correlation between the total percentage of *obscuratum* seeds in the plants examined and the percentage in their progeny was  $r = 0.346 \pm 0.278$ , which finally shews that the actual proportion of abnormal seeds in any plant exerts no influence on the proportion in its progeny.

The seeds from each plant were picked separately and in 1930 and 1931 also those from each branch were separated. The different branches differed in their proportion of *obscuratum* seeds to normal and the progeny of the different branches differed also, but there was no correlation between the proportions of *obscuratum* in the parent branch and in the progeny.

The absence of direct transmission of the seed type to the progeny shews that if the abnormal seeds are cases of somatic mutation the mutations must be confined to the epidermis. The distribution of the abnormal seeds on the plants was examined and shewed that in certain plants they tended to appear together only on certain branches, and these were ontogenetically connected, often being arranged vertically one above the other or in the same sector and the authoress expresses definite agreement with Tjebbes' view that the plants are monochlamydeous periclinal chimaeras.

During the five years 1,208 plants were examined and 528 of these had pods with *obscuratum* seeds; 1,391 out of the total 13,839 pods had abnormal seeds, i.e. 10.051 per cent. There were 890 of these (6.563 per cent) with all *obscuratum* seeds and 188 in which the seeds on one side of the pod were different from those at the other side. Only 10 pods, i.e. 0.073 per cent had a mixture of normal and abnormal pods on both sides of the placenta. This again shews the expected regular arrangement of the mutant tissue. The number of pods in which the first seed was on the right was equal to those with it on the left and the number of right and left types with any particular type of seed, normal or abnormal, was also equal.

A careful study of the position of the branches and pods of different types makes it possible to trace the position and extent of the mutant tissue.

828. DUNDAS, B.

635.652-2.42-1.521.6:578.081

**Growing powdery mildew on detached bean leaflets and breeding for resistance.**

Phytopathology 1934 : 24 : p. 1137. (Abst.)

Field observations and tests of powdery mildew (*Erysiphe polygoni*) infection of detached leaflets of *Phaseolus vulgaris* resting on a ten per cent sucrose solution in Petri dishes, indicated that the varieties Pinto, Hungarian, Yellow and selections from Lady Washington and Pink were resistant, while Robust, Small White, Red Kidney, Kotenashi, and many others were susceptible.

The dish test was also used to shew by results from  $F_2$  hybrids of a susceptible x resistant cross (e.g. Pinto x Robust) that resistance in the varieties tested was due to a simple dominant.

829. JANDOLO, D. S.

635.655:575:519.241.1

**Studies of types of correlation among different plants.**

Grain Prod. J. Saratov 1934 : No. 5 : 50-56.

Examinations were made on  $F_2$  populations of reciprocal crosses of two lines of soya bean differing in time of maturity, size of leaf and height of plant. Tables are given shewing the coefficients of regression between the different characters. Though no significant linear relationships were observed, significant curved regressions could be established between various characters, e.g., a greater length of vegetative period was associated with first a greater number of productive nodes, then later a diminution in this number, and conversely a rise in number of productive nodes was accompanied first by a reduction in vegetative period and then by an increase; with a rise in number of beans per plant the vegetative period first fell, then rose, and with increased vegetative period the number of beans was at first greater, then less. In the latter case the curve for vegetative period was bimodal owing to segregation.

The construction of curves of regression enables the breeder to select the most suitable portion of his material e.g. for maximum earliness, the lines with intermediate numbers of beans per plant; other curves shew that for maximum yield the lines with medium time of ripening must be selected.

830. TAKAHASHI, N. 635.655:575.116.1:581.4  
635.655:581.48-183  
(Linkage relation between the genes for the form of leaves and the number of seeds per pod of soybeans.)  
Jap. J. Genet. 1934 : 9 : 208-25.

Two varieties of soya bean, one with broad leaves and two-seeded pods, the other with narrow leaves and three-seeded pods were crossed.

The narrow leaf (*r*) behaved as a simple recessive to the broad leaved type (*R*) and the two-seeded character (*F*) was dominant to the three-seeded character (*f*) in a 3 : 1 ratio. Linkage was found between *R* and *F* with a crossing-over value of about 10 per cent. The action of the gene for seed number per pod was to some extent interfered with by the gene for leaf form and by some other genes not specified.

831. BUILIN, D. P. 635.655:581.162.32:578.08  
(On the technique of crossing soya beans.)  
Semenovodstvo (Seed Growing) 1934 : No. 1 : 27-28.

A description is given of the method used in making artificial hybridizations. If the time of flowering of the varieties differs by more than 15-20 days it must be adjusted by the influence of photoperiodism, covering the plants from the cotyledon stage onwards by wooden boxes and giving them only 10 hours' light per day during a period of 20 days for some varieties, 30 days for others.

832. GURSKII, N. 635.656:575(47)  
(From work on breeding peas.)  
Semenovodstvo (Seed Growing) 1934 : No. 1 : p. 30.

Breeding of peas has been in progress at the Novourgensk station since 1929, the object being to obtain a large-seeded, high yielding mid-early variety suitable for mechanized harvesting and a large, heavy yielding early variety for fallow cultivation. Both these have now been produced. Constant  $F_4$  and  $F_5$  hybrids have been obtained from the varieties Upright Victoria and Early Victoria, the former on account of its standing capacity, its compact inflorescence and uniform ripening being suitable for mechanized harvesting and the latter being chosen on account of its quality and earliness.

By the use of an unheated greenhouse two generations have been grown per year.

Some of the selections from local peas are equal to Victoria in quality and 15-20 per cent better in yield. Crosses between pea and gram (*Cicer arietinum*) are under investigation.

833. WELLENSIEK, S. J. 635.656:575.1  
De beteekenis van Mendels erwtenwerk. (The significance of Mendel's work on peas.)  
Ons Nageslacht 1934 : No. 2 : Pp. 5.

A concise outline of Mendel's work on peas with an indication of its value and its bearing on various branches of biological science.

834. RASMUSSEN, J. 635.656:575.11"793"  
Studies on the inheritance of quantitative characters in *Pisum*. I. Preliminary note on the genetics of time of flowering.  
Hereditas, Lund 1935 : 20 : 161-80.

The present work represents the first part of an attempt to obtain, by a statistical examination of the data, further evidence in support of the author's "interaction hypothesis" (see "Plant Breeding Abstracts" Vol. III, Abst. 76) in the inheritance of quantitative characters. Crosses were made and the data were obtained from the  $F_2$ ,  $F_3$  and  $F_4$  generations.

The results from the  $F_2$  shew that flowering time is partly determined by two main genes which are connected with the *A* factor (purple flower) and the *Le* factor (internode length). One gene *Xa* closely linked with *A*, which, when fully dominant, has a retarding effect on flowering.

Either very close linkage with a factor for earliness or pleiotropy must be assumed in the case of

the *Le* factor and the latter hypothesis is preferred. The *le* gene which retards earliness is therefore recessive for internode length and is shewn to be dominant for flowering time.

Besides the two main factors various modifying genes are assumed. In discussing the application of the results, further support is adduced for the author's hypothesis, and Sirk's hypothesis of multiple allelomorphs as the cause of quantitative variation is contradicted.

835. LAMPRECHT, H. 635.656:575.242:575.116.1  
Eine *Pisum*-Form mit *compactum*-Verzweigung und verkürzten Staubfäden.  
(A *Pisum* type with *compactum* branching and shortened stamens.)  
Hereditas, Lund 1935 : 20 : 94-102.

A mutation, first observed in the  $F_2$  of a cross between the pea varieties Hamlet and Witham Wonder is described. Most of the axils of the leaves bore instead of the usual inflorescence, a much branched stem with very reduced internodes. This type behaved as a simple recessive to the normal and the symbol *Brev-brev* is assigned to the gene pair concerned. An examination of the floral organs of the mutant shewed that the stamens were so reduced in length as to make self-fertilization impossible.

As it is considered to be unlikely that one pair of genes should determine two such diverse characters, a complex mutation of two very closely linked genes is suggested in explanation.

836. BRESLAVETS, L. P. and ATABEKOVA, A. I. 635.656:581.04:576.356.5  
(On increasing the yielding capacity of peas.)  
Semenovodstvo (Seed Growing) 1934 : No. 1 : 29-30.

Seeds were treated with "Biontizer" No. 84, consisting of a solution of 0.1 g. mercuric chloride and 0.5 g. potassium sulphate in 1,000 cc. water, for one hour, and dried on paper for 10-12 hours before sowing. Some of the seeds were also germinated in the laboratory for root tip examination. Control plants were treated identically but with distilled water and further controls were also sown dry. No difference in vegetative development was detectable between the three sets but the "biontized" plants greatly outyielded the controls: the number of mature pods, the number of seeds and, particularly, the weight of seed per plant were all increased. Cytological examination disclosed a much more vigorous cell development in the treated plants and this was accompanied by a very large proportion of polyploid and binucleate cells, over one hundred appearing in a single root tip. Other cells were observed in which the division more nearly resembled meiosis and only seven instead of the usual 14 chromosomes were present, bivalents even being present in certain cells.

837. MILOVIDOV, P. F. 635.657:576.356.5  
Případ mixoploidie u *Cicer arietinum* L. (A case of mixoploidy in *C. arietinum* L.).  
Preslia 1932 : 11 : 62-66.

In the dermatogen and the perilem of the roots of *C. arietinum* L. a number of cells with tetraploid nuclei were found; and the equatorial plates shewed 32 chromosomes of very unequal size, some of the largest being twice as large as the smallest. The chromosomes of one pair had each a satellite.

The diploid number in the root tip cells of the varieties *nigrum*, *sativum* and *rotundum* is 16.

838. MACKIE, W. W. 635.659-2-1.521.6:575.11  
Breeding for resistance in Blackeye cowpeas to *Fusarium* wilt, charcoal rot, and nematode root knot.  
Phytopathology 1934 : 24 : p. 1135. (Abst.)

In variety tests in soil infested with fusarium wilt (*Fusarium tracheiphilum*), charcoal rot (*Rhizoctonia bataticola*) and nematode root knot (*Hedera marioni*) Iron, Victor and Brabham were the only types of cowpeas good enough to be retained as breeding material.

In the  $F_1$  from artificial crosses of Iron x Blackeye resistance to all three diseases was dominant

while the seed was intermediate in size and black and dappled brown in colour. In  $F_2$  colour was dominant to eye type which broke up into black eye, brown eye and smoke eye types, black eye being epistatic to the other two.

There was apparently a correlation between dark leaf colour and disease resistance. Resistance to the three diseases appears to be related to the quality of the root cortex and it is suggested that suberin which exists in quantity in Iron (which is also an ancestor of Victor and Brabham) accounts for the resistance in the cross in question.

Back-crosses to the Blackeye parent have yielded apparently satisfactory resistant, Blackeye types.

## BOOK REVIEWS

FISHER, R. A.

519.2

### **Statistical methods for research workers.**

Biological Monographs and Manuals, No. V. Oliver and Boyd, Edinburgh and London, 1934 : 5th Ed. 15s. 0d. Pp. xiii + 319. 12 figs. 71 tables.

The appearance of a new edition of this book within two years of the last, or of five editions since 1925, is a welcome testimony to the success which has attended Professor Fisher's attempt to place the methods of statistics in the hands of research workers, most of whom are not equipped mathematically to grapple with the theoretical aspects of the subject, but have to be content with a general understanding of the principles involved, and a demonstration of the technique. In accordance with custom the material of the previous edition has been retained with practically no changes, while several additions have been made. Section 21.01 deals with a useful correction for continuity in the application of the  $\chi^2$  distribution, while in the same connexion the exact treatment of 2 x 2 Tables is described in Section 21.02.

Section 29.1 is new, and concerns corrections to be applied in multiple regression work when some of the independent variates are found to be of little interest, and it is desired to omit them without going back and solving again. From the information provided, the reader will hardly be able to generalize the formulae, but that does not matter, for with more than two variates to be omitted the method becomes laborious, and the procedure would normally be to eliminate the variates one at a time by a successive application of the first correction as here described. Even so, the formulae are not complete, for although the corrections to the sum of squares of deviations from the regression formula are given for one and two variates omitted, the corresponding adjustments of the remaining regression coefficients are only given for a single variate omitted. The correction for the multiplier of  $s^2$  to give the estimated variance of any  $b$  is not given. For example, in the formula for  $t$  (see p. 152)  $c_{11}$  should be replaced by  $c_{11} - c_{13}^2/c_{33}$ , for  $b_3$  omitted, and so on.

Section 49.1 on the Analysis of Covariance has been enlarged on pp. 266-8 to introduce the exact test of significance when real differences in treatment have been imposed. It may be unfair, in view of the wealth of the material put before us, to ask for more, but a widespread interest is being taken in this comparatively recent development, and one could wish that it had been possible to give a further illustration of the technique, if only to impress upon readers the meaning of such a test as is here described, while a word or two on the comparison of the quantities "of varying precision"  $y-bx$  by means of their standard errors would have been appropriate. The remaining changes are minor ones. At the foot of p. 139 a sentence is added on the more general case of the fitting of curved regression lines. In this connexion the attempts of Isserlis and Aitken to systematize the computations by means of orthogonal polynomials are worthy of mention. Readers should note the changes in the formulae on pp. 301-2. A reference is made to Helmert's pioneer work on what is now known as the  $\lambda^2$  distribution, and new references to the author's published papers for the years 1932-34 are added.

The book is still indispensable to the biological worker. J. W.

MOORE, E.

575.1

**Heredity mainly human.**

Chapman and Hall Ltd., London, 1934 : 15s. 0d. Pp. vii + 343, 17 figs.

Designed for "that rather neglected person, the educated and intelligent reader who knows nothing of the subject but wishes to understand its main outlines," the present volume is far from being a standard work on Mendelism. The elements of genetical theory are described in racy language, much stress being laid on the physiological rather than the merely formal aspects of inheritance, the examples being taken mainly from animals. The greater part of the volume is devoted to questions of human heredity, treated discursively, and with a eugenic bias.

WALTER, H. E.

575.1

**Genetics. An introduction to the study of heredity.**

MacMillan Company, New York, 1931 : 3rd Ed. 10s. 6d. Pp. xxi + 359, 92 figs.

Written in 1912, Professor Walter's book has been several times reprinted and revised and remains an adequate presentation of the early Mendelian phenomena and theory that we have now come to regard as classical, not omitting sex determination and the application of genetical theory to human society.

The third edition is provided with a supplement consisting of one hundred and one problems for use as exercises by students and teachers using the book.

MORGAN, T. H.

575.1:577.9

**Embryology and genetics.**

Columbia University Press, New York 1934 : \$3.00. Pp. vii + 258, 129 figs.

The development of the science of genetics between 1900 and the present day is one of the most remarkable chapters in the history of biology. One of the results is that genetics is beginning to abut on many other branches of biological science and books such as the present, relating genetical theory to the phenomena of allied sciences, are becoming more and more necessary. Dr. Morgan's work is naturally concerned with the animal kingdom, but plant geneticists will find in it much that is stimulating, especially in the discussions of the interaction between genes and protoplasm.

CRANE, M. B. and LAWRENCE, W. J. C.

575.1:634/5

**The genetics of garden plants.**

MacMillan and Co., Ltd., London, 1934 : 10s. 6d. Pp. xvi + 236. 53 illus. 42 tables.

Few investigators are better qualified than the authors of the present volume to undertake the task of bringing together the scattered facts of the genetics of horticultural plants. These plants have from the first served as the material from which many of the fundamental laws of genetics have been elucidated and the authors themselves have contributed much of the most important new knowledge regarding the genetical constitution and evolution of the fruit trees. Though practical breeders may still be loth to admit it, a knowledge of the chromosomes is the first essential in successful breeding combined with a knowledge of the laws of inheritance. Both these subjects are explained in simple terms by reference to well-known horticultural plants, at the same time avoiding the common error of making the processes appear simpler than they really are. The authors have not shirked an explanation of the phenomena and significance of polyploidy, pairing and segregation in auto-polyploids, and the role of interspecific crossing in the evolution of plant forms. In the sweet pea, the stock and the primula many of the main genetical phenomena were first discovered and these plants are taken as illustrations, their genetics being described in some detail, historically. The dahlia serves as an admirable example both of the genetics of polyploids and of the immense variation which arises when two already complex and highly differentiated polyploid hybrid species cross and give rise to a third new species, by chromosome doubling.

After the ornamental plants come the vegetable and salad plants. A brief survey is made of the genetics of the tomato, diploid and tetraploid, the garden pea, the radish, lettuce, onion and beet. Finally the genetics and cytology of the potato are reviewed in some detail, though the account suffers from the fact that the work of the Russian investigators, who have thrown more

light than anyone on this subject in the last few years, are mentioned by reference only to their early work, their later and much fuller published accounts being entirely ignored.

The genetics of the main fruit trees is reviewed on similar lines, strawberries also being included under this section. In breeding strawberries the authors recommend the use of the original species from which the cultivated strawberry arose and which have since been neglected; *Fragaria chiloense* is particularly recommended on the score of the authors' own results with this species.

Not the least interesting sections of the book are the chapters on general matters at the end. Sterility and incompatibility are treated separately in distinct chapters. A further chapter gives a brief but adequate account of chimaeras and somatic variations and the last chapter consists of a discussion of the origin of new and improved forms. Various ways in which this may come about are enumerated but examples are chiefly given of the origin of polyploid forms of fruit, usually after hybridization. Many of our best fruits are supposed to have originated in this way and an extract is given from a letter from Dr. V. Rybin supporting the authors' view that the domestic plum, *Prunus domestica*, has arisen by hybridization of *P. spinosa* and *P. cerasifera*. Dr. Rybin has raised seedlings from crosses of these two species and one of them is a hexaploid; the species occur together in the Caucasus and natural hybrids are not uncommon. No reader of this book can fail to be impressed by the volume of information that now exists on the nature and origin of our cultivated plants and by the extreme complexity of most, and it would seem the best, of them. The book is full of tables of data, diagrams and illustrations. It begins with an introduction by Sir Daniel Hall and ends with a glossary and selected bibliography.

SOUÈGES, R. 581.3  
L'embryologie végétale. Résumé historique. 2me époque : De Hanstein (1870) à nos jours. [**Plant embryology. Historical summary. Second period : from Hanstein (1870) to the present day.**]  
Hermann et Cie., Paris, 1934 : 12 fr. Pp. 59

SOUÈGES, R. 581.3  
La cellule embryonnaire. (**The fertilized egg-cell.**)  
Hermann et Cie., Paris, 1935 : 15 fr. Pp. 72. 16 figs.

GUILLIERMOND, A. 576.311.34  
Les constituants morphologiques du cytoplasme : le chondriome. (**The morphological constituents of the cytoplasm : the chondriome.**)  
Hermann et Cie., Paris, 1934 : 20 fr. Pp. 128. 39 figs.

GUILLIERMOND, A. 576.311.34  
Les constituants morphologiques du cytoplasme : le système vacuolaire ou vacuome. (**The morphological constituents of the cytoplasm : the vacuolar system or vacuome.**)  
Hermann et Cie., Paris, 1934 : 18 fr. Pp. 107. 39 figs.

The first two numbers are sequels to one already reviewed (see "Plant Breeding Abstracts" Vol. V, p. 167), the first continuing the historical summary of plant embryology down to the present day, the second, which with the preceding numbers is destined to form part of a work entitled "An introduction to the study of plant embryology," deals with the general morphology of the fertilized egg cell and is addressed more to those new to the subject than to the specialist.

The great progress made in recent years in our knowledge of the structure of the cell has been directed chiefly towards the nucleus and its importance in inheritance, rather to the neglect of the cytoplasm. It is however beginning to be realized that the cytoplasm has an important part to play and modern technique has made possible a more accurate study of its structure. The results of recent investigations are brought together in the last two numbers of this series which deal with the two types of cytoplasmic inclusions, the chondriosomes and the vacuoles.

- SCHIMPER, A. F. W. 581.9  
 Pflanzengeographie auf physiologischer Grundlage. Dritte, neubearbeitete  
 und wesentlich erweiterte Auflage herausgegeben von Dr. F. C. von Faber.  
 (Phytogeography upon a physiological basis. Third, revised and  
 enlarged edition edited by Dr. F. C. von Faber).  
 Gustav Fischer, Jena 1935: Bd. I. Pp. xx + 588. 198 figs. Bd. II Pp. xvi +  
 589-1612. 416 figs. Unbound RM 90, bound RM 97.

The stimulus given to the study of ecology by the appearance thirty-six years ago of the first edition of Schimper's now classical work, is reflected in this greatly amplified and largely re-constructed edition recently published.

The increase in data has necessitated a division into two volumes, the first containing the sections on the ecological factors, plant climates, formations and communities and the tropical zones and regions. The second volume includes the temperate zones, the polar and mountain regions and aquatic vegetation.

Most of the old illustrations have been replaced by new ones, and the maps have been brought up to date.

- BOWER, F. O. 583.1  
 Primitive land plants—also known as the Archegoniatae. 583.1:576.16  
 MacMillan and Co., London, 1935: 30s. 0d. Pp. xiv + 658. 465 figs.

There can be few students of botany for whom Prof. Bower's "The Origin of a Land Flora" has not been the object of continual reference and the source of constant inspiration in all questions connected with the lower land plants and their bearing upon the origin of the higher plants. After twenty-six years the author again reviews the situation. The discovery of the Devonian fossils and a series of other accumulations of new facts have materially altered his views on origins and relationships and the present volume, though a large part of the original matter and illustrations has been preserved, constitutes a new work rather than a revision of the earlier one. Not the least valuable portion of the book will be the author's summing up of his views as they now stand, in the light of the present array of facts, upon the interrelationships of the various lower groups, in which he attempts to formulate a phylogenetic system which will be applicable not only to these groups alone, but will give a line along which the later evolutionary trends may also be considered.

Prof. Bower is in a unique position to review this situation and students of botany are indebted to him for having brought the light of a life-time's devotion to the subject to bear once more upon one of the most fascinating of botany's problems.

- ARBER, A. 585.421  
 The Gramineae. A study of cereal, bamboo, and grass.  
 The University Press, Cambridge, 1934: 30s. 0d. Pp. xvii + 480. 212 figs.

In this fascinating study of grasses the author has chosen as her central theme "the pattern and rhythm underlying that complex of plant types called the Gramineae." Into this she has woven the richness of her own knowledge and the results of her own and other researches as well as drawing upon the experiences of man in his relation to the grasses throughout the ages. Only very few of the aspects illustrated can be noticed in this brief review.

The cereals in particular are considered as their relation to man has been a definite factor in their evolution.

Four chapters are devoted to the bamboos including a consideration of the tree habit.

The various phases in the life history of the grasses are dealt with in turn and there is a chapter on the "two putative hybrids," maize and *Spartina Townsendi*.

Finally, in the chapter on the pattern and rhythm in the Gramineae the relationships of the group are shewn as linked up within the definite framework which the fundamental pattern has imposed.

The book is abundantly illustrated, chiefly by the exquisite line drawings of the author herself.

BEZEMER, T. J. 63(014)  
**Dictionary of terms relating to agriculture, horticulture, forestry, cattle breeding, dairy industry and apiculture in English, French, German and Dutch.**

George Allen and Unwin, Ltd., London, 1934 : 25s. 0d. Pp. vii + 249.

What are the English and Latin equivalents of Steckrube, Zwetsche, bietenbrand, vortelvlieg, février d'Amérique, laitue lombarde? These and a hundred and one other such questions can be answered by reference to this new dictionary, which will prove invaluable to biologists called upon to read literature in English, French, German or Dutch. The dictionary has been compiled by a group of Dutch scientists under the direction of Professor Bezemer of the State Agricultural College, Wageningen. It is arranged in four sections, English, German, Dutch, and French, in each of which the equivalents in the other three languages are given and in the case of an organism the Latin name is usually added.

The work is on the whole remarkably complete, though there are certain omissions and vaguenesses that might with advantage have been made up at the expense of redundancies elsewhere—for instance one wonders whether the entries under capillarity, capillary, capillary action, capillary ascent, capillary attraction, capillary tube and capillary vessel are all necessary. The sins of omission are, however, comparatively few and the work gains in value by the presence of numerous cross-references.

MORSTATT, H. 632.9:016  
**Bibliographie der Pflanzenschutz-Literatur—das Jahr 1932. (Bibliography of the literature on plant protection for the year 1932.)**

Paul Parey and Julius Springer, Berlin, 1933 : Pp. iv + 259

MORSTATT, H.  
**Bibliographie der Pflanzenschutz-Literatur—das Jahr 1933. (Bibliography of the literature on plant protection for the year 1933.)**

Paul Parey and Julius Springer, Berlin, 1934 : Pp. iv + 316.

As in the bibliography for 1931 already reviewed (see "Plant Breeding Abstracts" Vol. III, p. 153) the literature is classified under the four headings, general, diseases and their causes, plant hosts and measures for plant protection. An author index is appended.

NOWACKI, A. 633.1-1

Anleitung zum Getreidebau auf wissenschaftlicher und praktischer Grundlage.

8. Auflage, vollständig neubearbeitet von Professor Dr. K. Opitz. (An introduction to the cultivation of cereals on a scientific and practical basis. 8th edition completely revised by Professor Dr. K. Opitz.)

Paul Parey, Berlin 1934 : RM. 5.80. Pp. viii + 194. 98 illus.

This useful textbook since the death of the author has now undergone complete revision and been brought up to date by Dr. Opitz. The first part deals with the development of the cereal plant from germination to maturity and the second with its cultivation from seeding to harvest.

BRITON-JONES, H. R.  
**The diseases and curing of cacao.**

MacMillan and Co., Ltd., London, 1934 : 10s. 0d. Pp. x + 161. 37 figs.

The present volume is intended to form one of a series of handbooks dealing with the diseases which affect the major tropical crops.

Compiled in the first place for Agricultural Officers and planters, detailed descriptions of microscopical observations are omitted and greater attention is paid to the macroscopical symptoms of the disease.

The diseases are grouped under those affecting the root, stem and pod and their appearance on the plant is amply illustrated by photographs. The last section of the book is devoted to the preparation or "curing" of cacao. The methods in use in different countries are briefly described, the basic principles are considered and certain modifications of existing methods are suggested. A bibliography of 192 titles is appended to the section on diseases and one of 40 to that on cacao fermentation.

RUDLOFF, C. F. and SCHANDERL, H. 634.581.162.3  
 Die Befruchtungsverhältnisse bei unseren Obstgewächsen. Ein Taschenbuch für die Obstbaupraxis und für den Liebhaber, zugleich auch ein Lehrbuch für den Gebrauch an Gartenbaulehranstalten. (**The pollination of our fruit trees. A handbook for the practical grower and the amateur, as well as a text book for the use of horticultural institutes**).  
 Rud. Bechtold und Comp. Wiesbaden 1934 : RM 2. Pp. 71. 20 illus.

Intended as a handbook for the practical man, the present work summarizes the results of the numerous investigations on the pollination of fruit trees, a subject which is now proved to be of first rate importance to the fruit grower. The basic scientific principles are briefly expounded with the aid of numerous diagrams and the reactions of the principal varieties of fruit trees and fruit to pollination are given. Lists are provided of the principal varieties of pome and stone fruit and their value as pollinators.

WARDLAW, C. W. 634.771-2  
 633.526.1-2  
**Diseases of the banana and of the Manila hemp plant.**  
 MacMillan and Co. London 1935 : 30s. 0d. Pp. xii + 615. 2 pls. 295 figs. 39 tables.

The whole industry of banana cultivation and export has in the last few decades turned on the possibility of growing types immune to disease, to the ravages of the all-important wilt, or Panama Disease, in particular. The one variety that we are accustomed to see on the dinner table, and which many of us even regard as the only type of banana, the Gros Michel, is fatally susceptible to the disease. Various resistant varieties are known but all of them fall short as regards commercial requirements, some being deficient in one respect, others in another. Efforts to replace the Gros Michel have been made for some time and these have led to the growth of an entire new field of plant breeding, genetics and cytology, in itself a most fascinating study. It is obvious therefore that a knowledge of the diseases of the banana, which are unfortunately many and various, is indispensable to everyone who is in any way concerned with the banana and its cultivation. Dr. Wardlaw has for the first time made this knowledge available to the public, in a general and comprehensive review of the information existing at the present time, a large amount of which, incidentally, he is personally responsible for, together with his colleagues at the Imperial College of Tropical Agriculture, Trinidad. All the most important fungal and bacterial diseases, not only of the banana, but of abacá (*Musa textilis*) too, are dealt with at length, and attention is also given to virus and physiological diseases, and to diseases incurred during storage. The information on the physiological forms of the wilt fungus, *Fusarium cubense*, is reviewed and a list of the bacteria and fungi known to occur on the banana as saprophytes and parasites further enhances the value of the book to the practical worker.

The banana breeding work of the Imperial College of Tropical Agriculture is outlined in the chapter on the Panama Disease and confidence is expressed that, in spite of the many attendant difficulties, this work will lead to the production of the desired new immune variety. The volume is well and copiously illustrated and terminates with a comprehensive bibliography and index.

BAKER, F. S.

634.9

**Theory and practice of silviculture.**

McGraw-Hill Book Co., Inc. New York and London 1934 : 30s. 0d. Pp. xiv + 502. 87 figs. 51 tables.

This new volume of the American Forestry Series deals both with the biological foundations and the practice of silviculture. The physiological aspect is stressed and it is significant of the trend of modern thought that the first chapter is devoted to forest genetics. The general principles of plant physiology and ecology are treated appropriately in relation to forestry, followed by more specialized sections on silviculture proper.

The book terminates with a useful list of the common names of trees with their Latin equivalents, a bibliography of twenty pages and an index.

SCHOENICHEN, W.

634.97

**Deutsche Waldbäume und Waldtypen. (German forest trees and forest types.)**

Gustav Fischer, Jena 1933 : Unbound RM 14, bound RM 15.50. Pp. xii + 208. 51 illus, 20 figs.

A valuable handbook treating the various species in turn, giving their German and Latin names, with short descriptive passages describing their European distribution, habitat and main ecological requirements. Diagrams illustrate the areas of distribution of the species and their varieties. There is an extensive bibliography and the volume concludes with a number of excellent photographic plates of the main tree types.

**NEW JOURNALS**

*Revista Argentina de Agronomía.* In June, 1934 the first number of this journal appeared and the fourth number, completing Volume I was published in December of the same year. The object of the journal is to present the results of the serious studies in scientific agriculture carried out in Argentina and the proposed field covers cytology, histology, morphology, physiology, genetics, ecology, systematics, phytogeography, ethno-botany, plant pathology, agrology, agricultural micro-biology, agricultural chemistry, agriculture, cereals, forage plants, horticulture, arboriculture, silviculture, viticulture. The Journal is in Spanish. A section entitled "Notas Varias" gives an opportunity of presenting preliminary results or observations and other sections give notices of current events and bibliographical data.

The first number opens, appropriately enough, with a Spanish translation of Mendel's original work.

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